MODELS 17824A, 17906, 17908 & 17922

CHASSIS E1000D & P1000D
RUN 1
BOOK NO. 94X867 152

television
SERVICE MANUAL

92X1467

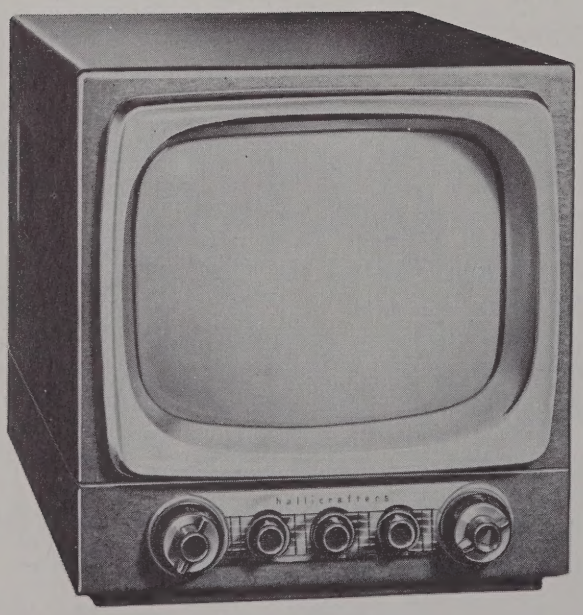
1951
SERIES

MODEL 17824A—MAHOGANY TV RECEIVER WITH 17" RECTANGULAR PICTURE TUBE
(SEE PAGE 2 FOR OTHER CABINET ILLUSTRATION)

the hallicrafters co.
MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A.

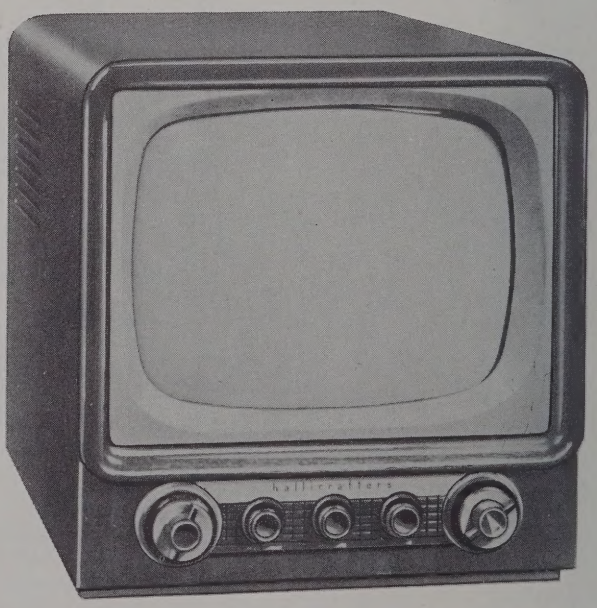
92X1598

MODEL 17922—MAHOGANY TV RECEIVER WITH 17" RECTANGULAR PICTURE TUBE AND REMOVABLE PICTURE TUBE ESCUTCHEON AND SAFETY GLASS ASSEMBLY



92X1596

MODEL 17906—MAHOGANY LEATHERETTE TV RECEIVER WITH 17" RECTANGULAR PICTURE TUBE AND REMOVABLE PICTURE TUBE ESCUTCHEON AND SAFETY GLASS ASSEMBLY



92X1597

MODEL 17908—MAHOGANY TV RECEIVER WITH 17" RECTANGULAR PICTURE TUBE

GENERAL SPECIFICATIONS

ANTENNA	BUILT-IN
TUNING COVERAGE	12 CHANNELS, 2-13
PICTURE CARRIER I-F	26.25 MC
SOUND CARRIER I-F	21.75 MC
INTER-CARRIER SOUND SYSTEM	4.5 MC
SPEAKER, MODELS 17906, 17908 & 17922	5 INCH PM
SPEAKER, MODEL 17824A	8 INCH PM
POWER SUPPLY INPUT	110-120 VOLTS 60 CYCLES AC 235 WATTS
TUBES	21, INCLUDING 3 RECTIFIERS

TUBE COMPLEMENT

V 1	6CB6	RF AMPLIFIER
V 1	6AG5 OR 6BC5 OR 6CB6	RF AMPLIFIER (1D1055 TUNER ONLY)
V 2	6J6	OSC./MIXER
V 101	6CB6	1ST I-F AMPLIFIER
V 102	6CB6	2ND I-F AMPLIFIER
V 103	6CB6	3RD I-F AMPLIFIER
V 104	6AL5	VIDEO DETECTOR
V 105	6CB6	VIDEO AMPLIFIER
V 106	12AU7 OR 6SN7GT*	SYNC. AMP. & SEP.
V 107	12AU7 OR 6SN7GT*	SYNC. CLIPPER & VERTICAL OSC.
V 108	6S4	VERTICAL AMPLIFIER
V 109	6AU6	AUDIO I-F AMPLIFIER
V 110	6AL5	AUDIO DETECTOR
V 111	6AV6 OR 6SQ7*	1ST AUDIO AMPLIFIER
V 112	6AQ5	AUDIO OUTPUT
V 113	6AX5GT OR 6X5GT	LV RECTIFIER
V 114	5U4G	LV RECTIFIER
V 115	6SN7GT	HORIZONTAL OSCILLATOR
V 116	6AU5GT OR 6AV5GT	HORIZONTAL AMPLIFIER
V 117	6W4GT	DAMPER
V 118	1B3GT	HV RECTIFIER
V 119	17BP4A	17" RECTANGULAR BLACK PICTURE TUBE

* These tubes are not directly interchangeable. For socket wiring of each type refer to the Schematic Diagram. When replacing tubes use the same types as found in the receiver chassis.

OPERATION OF THE RECEIVER CHASSIS OUTSIDE OF THE CABINET INVOLVES DANGER OF ELECTRICAL SHOCK. EXERCISE ALL NORMAL HIGH VOLTAGE PRECAUTIONS WHEN WORKING WITH THIS RECEIVER.

MODEL COMPARISON

Television receiver models 17824A and 17906 have a P1000D chassis using the 1D1055 tv tuner; models 17908 and 17922 have an E1000D chassis using the 1D961, 1A1077, or 1D1088 Dynamic tv tuner. Model 17824A has an eight inch speaker. The other models have a five inch speaker.

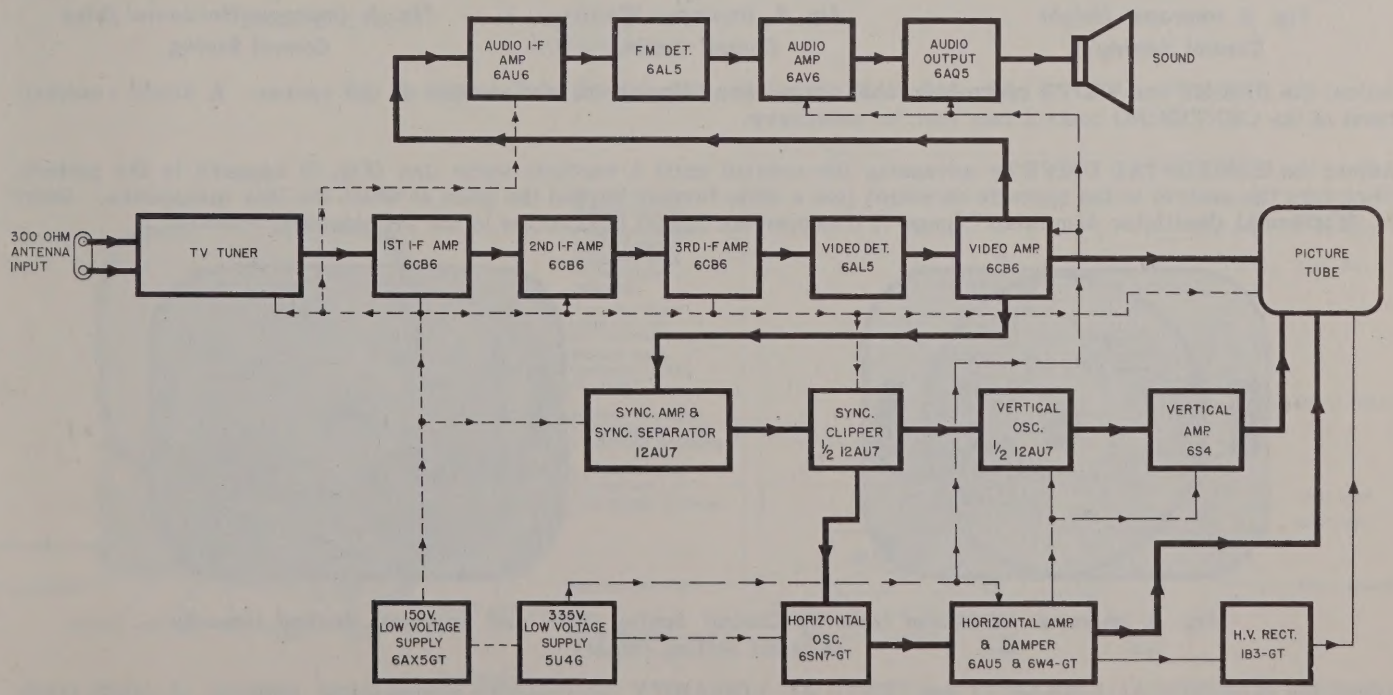


Fig. 1. Functional Block Diagram

9201638

SERVICE ADJUSTMENTS

Note: The sequence of "SERVICE ADJUSTMENTS" outlined herein is suggested as a convenient method of approach and is not an arbitrary procedure. Variations of the procedure are permitted to obtain the final result.

The service adjustment controls normally will require minor adjustments if any circuit changes or tube replacements are made. The use of a test pattern, generated in the shop or obtained from a television station, is recommended for best adjustment results. The operating controls, located on the front apron of the chassis, should be set for as good a picture as possible before making the following adjustments.

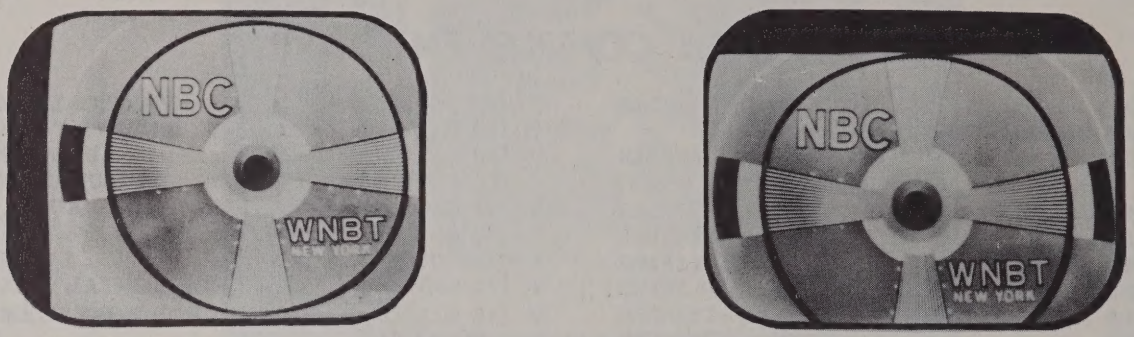


Fig. 2. Improper Centering Adjustments

If the picture is not properly centered, remove the centering CONTROL LOCK SCREW(S) and move the CENTERING LEVER a short distance in any direction required to recenter the picture. DO NOT use undue force in making this adjustment as excessive strain may be exerted on the neck of the picture tube. If proper centering cannot be restored in this manner, a slight readjustment of the deflection yoke mounting may be necessary.

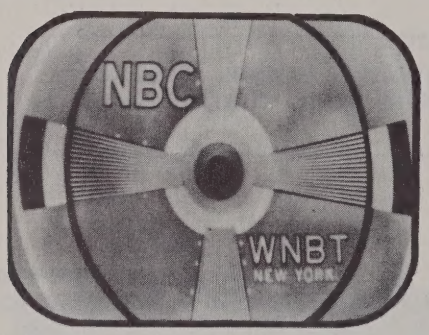


Fig. 3. Improper Height Control Setting

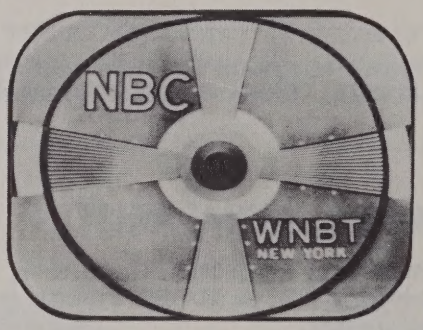


Fig. 4. Improper Width Control Setting

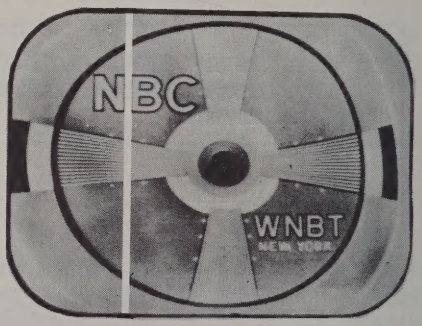


Fig. 5. Improper Horizontal Drive Control Setting

Adjust the HEIGHT and WIDTH controls so that the picture fills out the dimensions of the screen. A slight readjustment of the CENTERING control may then be necessary.

Adjust the HORIZONTAL DRIVE by advancing the control until a vertical white line (Fig. 5) appears in the pattern. Then turn the control in the opposite direction just a little further beyond the point at which the line disappears. Refer to "Horizontal Oscillator Alignment" (page 7) if proper horizontal hold action is not yet obtained.

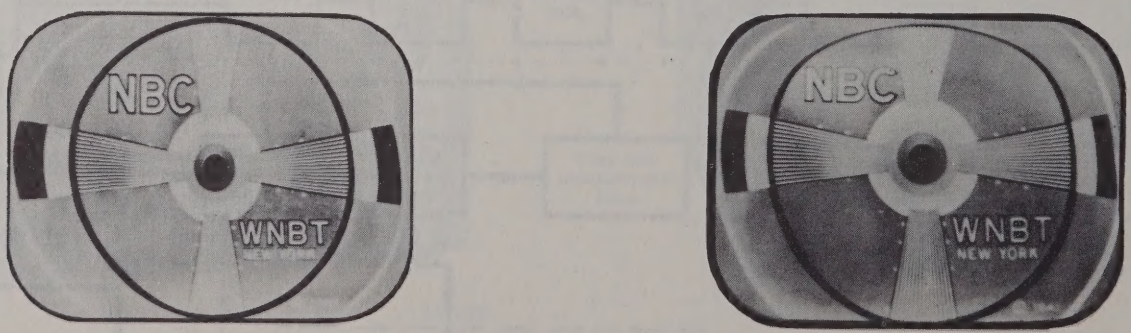


Fig. 6. Improper Horizontal Linearity Control Setting (Left) and Improper Vertical Linearity Control Setting (Right)

Adjust the HORIZONTAL LINEARITY and VERTICAL LINEARITY controls for a symmetrical pattern. A slight readjustment of the HEIGHT and WIDTH controls may then be necessary.

TEST PATTERNS COURTESY RCA SERVICE CO.

REMOVABLE PICTURE TUBE ESCUTCHEON AND SAFETY GLASS ASSEMBLY

Television receiver models 17906 and 17922 are equipped with a picture tube escutcheon and window assembly that can be easily removed from the front of the cabinet. The safety glass window and the face of the picture tube are therefore readily accessible for cleaning without removing the chassis from the cabinet.

CAUTION

The receiver must be turned off before the cleaning operation is performed, to eliminate any possible shock hazard.

1. Place a finger of each hand into the access notches located on the bottom of the plastic picture tube ESCUTCHEON, and pull forward to remove it from the cabinet.

2. The safety glass window is held in place by a RUBBER WASHER, STEEL WASHER and FASTENING SCREW, located at the corners. Remove this hardware and carefully take the window away from the cabinet.

3. Clean the safety glass and face of the picture tube with a damp soft cloth and wipe all surfaces dry with a lintless cloth before reattaching the safety glass to the cabinet.

4. When fastening the safety glass to the cabinet, be sure that only the RUBBER WASHERS touch the surface of the glass and tighten the FASTENING SCREWS evenly to avoid excessive strains which may crack the glass.

5. The plastic ESCUTCHEON has projections on the interior surface that fit into each of the four retaining SPRING CLIPS mounted on the cabinet. Fit the ESCUTCHEON carefully into place and then apply slight pressure to secure it.

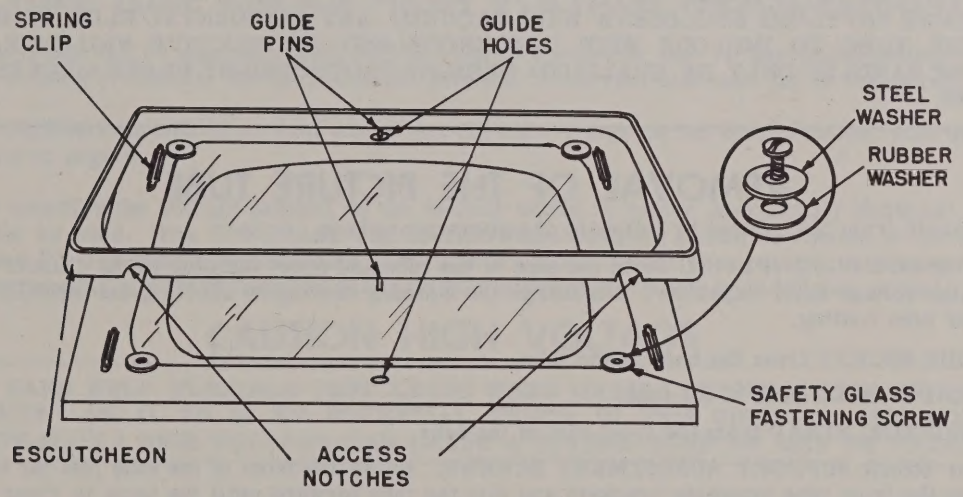
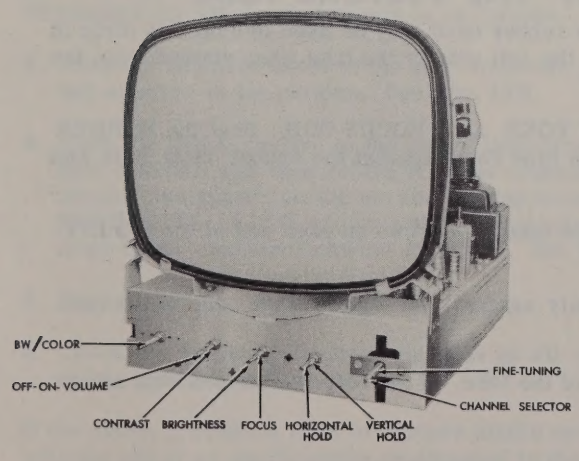
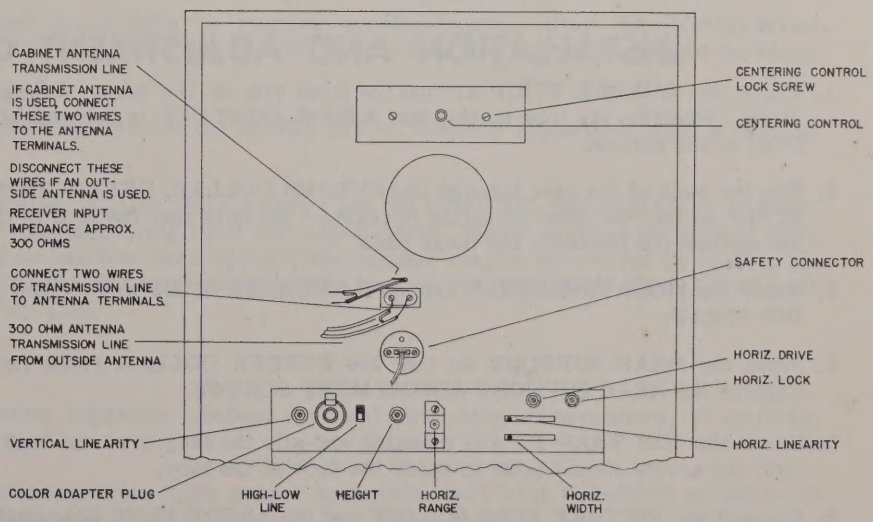


Fig. 7. Picture Tube Escutcheon and Safety Glass Assembly 92A1605



92X1394-A

Fig. 8. Front Chasiss View


CABINET ANTENNA TRANSMISSION LINE
IF CABINET ANTENNA IS USED, CONNECT THESE TWO WIRES TO THE ANTENNA TERMINALS.
DISCONNECT THESE WIRES IF AN OUT-SIDE ANTENNA IS USED.
RECEIVER INPUT IMPEDANCE APPROX. 300 OHMS
CONNECT TWO WIRES OF TRANSMISSION LINE TO ANTENNA TERMINALS.
300 OHM ANTENNA TRANSMISSION LINE FROM OUTSIDE ANTENNA
VERTICAL LINEARITY
COLOR ADAPTER PLUG
HIGH-LOW LINE
HEIGHT
HORIZ. RANGE
HORIZ. WIDTH
CENTERING CONTROL LOCK SCREW
CENTERING CONTROL
SAFETY CONNECTOR
HORIZ. DRIVE
HORIZ. LOCK
HORIZ. LINEARITY

92C1529-A

Fig. 9. Rear Cabinet View

REMOVAL OF THE CHASSIS FROM THE CABINET

1. Remove the knobs on the front panel by pulling them forward.
2. Loosen the panel, mounted on the cabinet back, through which the CENTERING CONTROL LEVER protrudes, by removing the CENTERING CONTROL LOCK SCREW(S).
3. Remove the screw located directly above the SAFETY CONNECTOR.
4. Disconnect the antenna leads from the antenna terminal strip.
5. Remove the cabinet back mounting screws and then remove the cabinet back.
6. Remove the speaker plug at the chassis. On table models, remove the speaker mounting nuts and lift out the speaker.
7. Removal of the chassis may now be completed by removing the five chassis mounting screws (located at bottom of cabinet) and sliding the chassis from the cabinet.

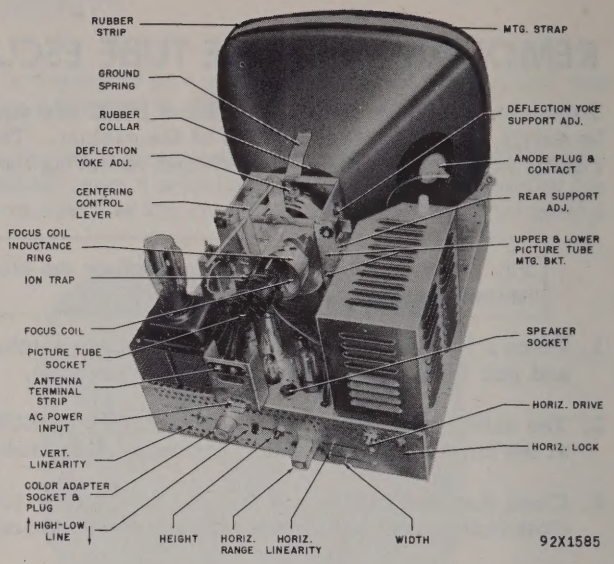


Fig. 10. Rear Chassis View

PICTURE TUBE HANDLING PRECAUTIONS

THE PICTURE TUBE ENVELOPE ENCLOSES A HIGH VACUUM. ANY ACCIDENTAL BLOW OR ROUGH HANDLING MAY CAUSE THE TUBE TO IMPLODE WITH DANGEROUS AND DESTRUCTIVE VIOLENCE. THE PICTURE TUBE SHOULD BE HANDLED ONLY BY QUALIFIED PERSONS PROTECTED BY HEAVY GLOVES AND SHATTER-PROOF GOGGLES.

REMOVAL OF THE PICTURE TUBE

1. Remove the chassis from the cabinet by following the above procedure.
2. Disconnect the ANODE PLUG (PL-104) from the side of the tube and short the plug to the chassis to insure the discharge of the high voltage filter capacitor. Discharge the aquadag coating by shorting the ANODE CONTACT of the tube to the outer tube coating.
3. Remove the TUBE SOCKET from the base of the tube.
4. Slip the ION TRAP from the neck of the tube.
5. Remove the MOUNTING STRAP from the front rim of the tube.
6. Loosen the four REAR SUPPORT ADJUSTMENT SCREWS. Raise the front of the tube just far enough to clear the two stop pads on the front tube mounting brackets and slip the tube forward until the neck is clear of the DEFLECTION YOKE and FOCUS COIL.

CAUTION--If the tube fails to slip out smoothly, investigate and remove the cause of trouble. DO NOT USE FORCE.

INSTALLATION AND ADJUSTMENT OF THE PICTURE TUBE

1. Place the RUBBER STRIP around the front rim of the tube. A large rubber band may be used to hold this strip in place. Position the tube so that the ANODE CONTACT is located at the left side of the tube when viewed from the front of the screen.
2. Slip the neck of the tube through the RUBBER COLLAR, DEFLECTION YOKE and FOCUS COIL. Seat the RUBBER STRIP on the two front mounting brackets. Be sure that the face of the tube rests against the rubber stop pads and not against the brackets for these pads.
3. Place the MOUNTING STRAP around the RUBBER STRIP and tighten the take-up screws on each end of the MOUNTING STRAP.
4. Move the REAR SUPPORT so that the RUBBER COLLAR rests firmly against and supports the cone of the tube. Tighten the REAR SUPPORT ADJUSTMENT SCREWS.
5. Check the ION TRAP for any marking and slip the trap over the neck of the tube. If the trap is stamped with an arrow, the arrow should point towards the face of the tube.
6. Connect the PICTURE TUBE SOCKET and the ANODE PLUG (PL-104).
7. Turn the receiver on and allow a few minutes for warm-up.

8. Turn up the BRIGHTNESS control and set the ION TRAP for maximum raster brilliance, backing off the BRIGHTNESS control as the maximum point is approached. The ION TRAP must be rotated about the axis of the tube as well as shifted along the neck to obtain the proper setting. With the BRIGHTNESS control set for slightly above normal brilliance and the CONTRAST control full counterclockwise, adjust the FOCUS control until the lines of the raster are clearly visible. Readjust the BRIGHTNESS control for normal brightness and touch up the ION TRAP setting.

9. Connect the antenna and tune in a test pattern.

10. Readjust the CONTRAST control until the different shades of the gray scale are clearly visible on the test pattern.

11. Check the position and appearance of the test pattern. If it is off center or shadowed at the corners (electron beam striking the neck of the tube) adjust the CENTERING LEVER. Set the FOCUS control at the center of its range and adjust the FOCUS COIL INDUCTANCE RING as necessary so that a clear sharp picture may be obtained well within the range of the FOCUS control.

CAUTION - It is not necessary to move the CENTERING LEVER excessively in any direction. Excessive force on the CENTERING LEVER may snap the neck of the tube.

12. If the lines of the raster are not horizontal or square with respect to the escutcheon, loosen the DEFLECTION YOKE ADJ. thumb screw and rotate the DEFLECTION YOKE until the proper raster position is obtained. After the adjustment has been completed, tighten the thumb screw.

13. Follow the procedure under "SERVICE ADJUSTMENTS" (pages 4 and 5) and make any minor adjustments necessary to obtain a properly adjusted pattern.

PICTURE TUBE ANODE HIGH VOLTAGE MEASUREMENT

The second anode potential will be approximately 12,500 volts in a receiver that is functioning properly. If it is possible to obtain good picture brilliance, the second anode potential is correct and need not be measured.

The setting of the HORIZONTAL DRIVE control will affect the high voltage on the second anode. Instructions for setting this control are given on page 4.

If it is necessary to measure the voltage present on the second anode, a meter specifically designed for high voltage measurements should be used. The CONTRAST and BRIGHTNESS controls should be rotated to the extreme counterclockwise position and PL-104 should be connected to the picture tube. Under these conditions the test meter will load the high voltage power supply approximately the same amount as the picture tube would during normal operation.

CAUTION HIGH VOLTAGE

DO NOT USE HAND HELD FLEXIBLE TEST LEADS WHEN MAKING SECOND ANODE HIGH VOLTAGE MEASUREMENTS. AN 11 TO 14 KV POTENTIAL EXISTS IN THIS CIRCUIT. ANY ACCIDENTAL CONTACT WITH SUCH A HIGH VOLTAGE CAN CAUSE A SEVERE BURN OR MAY BE FATAL.

HORIZONTAL OSCILLATOR ADJUSTMENT

If the HORIZONTAL HOLD control on the front panel fails to restore synchronization after the HORIZONTAL DRIVE is properly adjusted (page 4), the HORIZONTAL RANGE and HORIZONTAL LOCK adjustments should be reset. Procedure for these adjustments is as follows:

1. Turn the HOLD control to the full clockwise position. Adjust the HORIZONTAL RANGE adjustment until a vertical bar appears in the pattern. See Fig. 12B.

2. Turn the HOLD control to the full counterclockwise position. Momentarily set the CHANNEL SELECTOR to an adjacent channel, and then return it to the original channel being used for adjustment. Three or four horizontal bars should then appear on the screen. If too many or two few bars appear, the number may be decreased by turning the HORIZONTAL LOCK adjustment in the clockwise direction, or increased by turning the HORIZONTAL LOCK adjustment in the counterclockwise direction. See Fig. 12A.

3. Repeat step 1.

4. Check the action of the front controls on all active channels. Repeat the first three steps if necessary, to maintain stable synchronization.

If the above procedure fails to restore stable synchronization, make proper horizontal oscillator waveform adjustments with the aid of an oscilloscope as directed in the following steps.

5. Connect the oscilloscope as shown in Fig. 11. Adjust the TERTIARY WAVEFORM adjustment until the sine wave is equal in amplitude to the peak of the sawtooth. See Fig. 12C. Vary the HORIZONTAL RANGE adjustment to keep the picture synchronized.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious.

On the other hand, if the broad peak is higher than the sharp peak, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the HOLD control approaches the clockwise position.

6. Remove the oscilloscope and repeat steps 1 and 2 if necessary.

7. Check the action of the front panel controls and repeat the above steps as required to provide positive synchronization on all active channels.

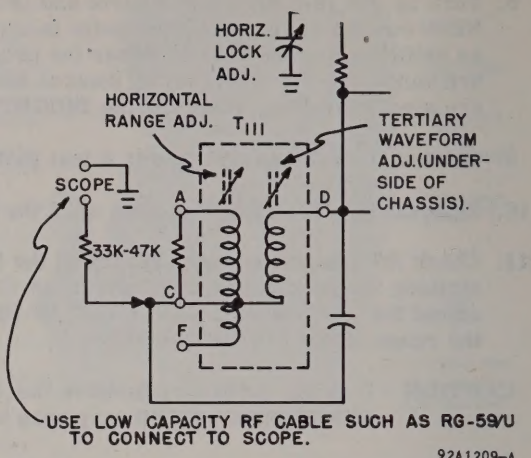


Fig. 11. Oscilloscope Connection for Horizontal Oscillator Alignment

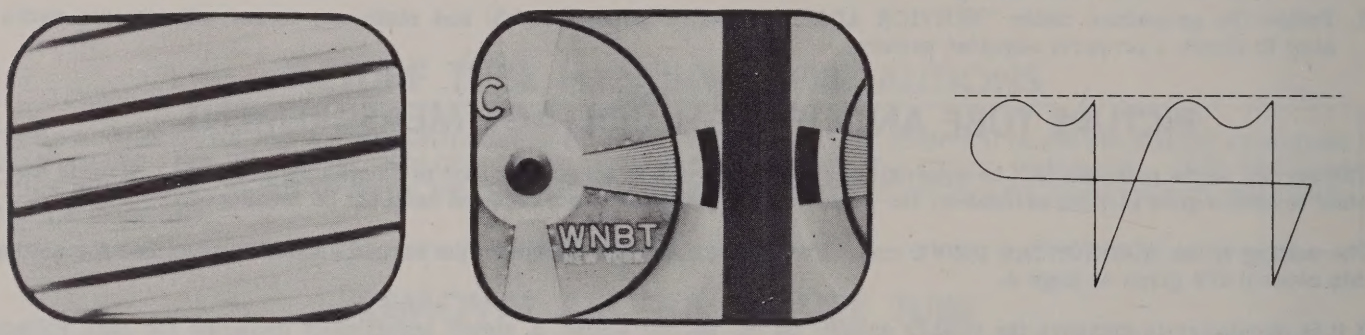


Fig. 12. Horizontal Oscillator Test Patterns and Waveform

FM SOUND CHANNEL ALIGNMENT

EQUIPMENT REQUIRED

Signal generator covering 4 to 30 mc.

Vacuum tube voltmeter (VTVM)

1N34 crystal detector circuit as shown in Fig. 13.

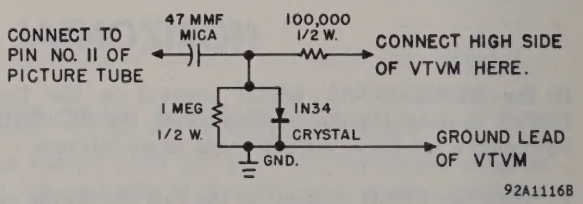


Fig. 13. Sound Alignment Test Circuit

PROCEDURE

1. Connect the signal generator output, through a .005 mfd. capacitor, to test terminal (A). (See Fig. 20 or 22.) Ground the shield of the generator output cable to the chassis, near terminal (A).

2. Connect the detector circuit and VTVM as shown in Fig. 13. Adjust the generator output (unmodulated) to give a 1 volt reading on the VTVM.

3. Adjust L-104, 4.5 MC TRAP ADJ., (Fig. 20 or 22) at 4.5 mc for a minimum VTVM reading. Disconnect the test circuit.

4. Connect the VTVM to test terminal (B) (pin 2 of fm detector, V-110).

5. Adjust L-105, 4.5 MC LIMITER GRID ADJ., (Fig. 20 or 22) and the primary of T-108 (bottom core) for a maximum VTVM reading.

6. Connect the VTVM to test terminal Ⓒ. (See Schematic Diagram). Adjust the secondary of T-108 (top core) for the zero reading which occurs between the positive and negative peaks. If the zero reading occurs at more than one setting, use the position nearest the top limit of the tuning core.

7. Shift the signal generator an equal amount on either side of 4.5 mc and touch up the primary of T-108 (bottom core) for approximately equal peaks. Use just enough signal output to obtain one volt peaks for best results.

8. Disconnect the test equipment and tune in a test pattern. Adjust L-104 for maximum vertical wedge definition.

I-F AMPLIFIER ALIGNMENT FOR E1000D CHASSIS USING 1D961, 1A1077, OR 1D1088 TUNERS

(SEE PAGE 16 FOR INFORMATION ON P1000D CHASSIS USING 1D1055 TUNER.)

1. Connect a VTVM between test terminal Ⓐ and the chassis. See Fig. 20.

2. Connect the high side of a signal generator to the shield of the OSC./MIXER tube (6J6). This connection will capacitively couple the generator output to the tube. Make sure that the shield is ungrounded by raising it above the grounded clips that hold it in place. Connect the ground return of the generator to any chassis point near the base of the tube.

3. Set the CHANNEL SELECTOR to any vacant channel.

4. Set the signal generator output (unmodulated) for a two volt dc reading on the VTVM and adjust the four i-f transformers according to the I-F AMPLIFIER ALIGNMENT CHART shown below. Readjust the signal generator output as required to maintain the two volt potential at the VTVM.

5. After adjusting the 21.75 mc sound trap (bottom slug of T-103), recheck the setting of the top slug of T-103.

NOTE: The bottom tuning slugs of T-101 and T-103 are concealed by wax. Remove and save the wax. After the powdered iron slugs have been adjusted, replace the wax, and melt it with a soldering iron to secure the slugs so that their settings will not change when the chassis is subjected to normal operating conditions.

I-F AMPLIFIER ALIGNMENT CHART

Signal Generator Frequency (No Modulation)	Adjustment	Location	VTVM Indication
24.75 mc	*T-101 (top)	Fig. 24	Maximum
24.75 mc	*T-101 (bottom)	Fig. 25	Maximum
25.6 mc	T-102 (top)	Fig. 24	Maximum
23.1 mc	T-103 (top)	Fig. 24	Maximum
24.5 mc	T-104 (top)	Fig. 24	Maximum
21.75 mc	T-103 (bottom)	Fig. 25	Minimum

*NOTE: The 1st i-f amplifier transformer (T-101) has two iron cores and must be adjusted from both top and bottom for a 24.75 mc response. Since this is an overcoupled transformer with a broad response, it is necessary to connect a 1,000 ohm resistor across the primary winding (at the tuner terminals) when tuning the secondary (bottom slug) and then to connect the same resistor across the secondary winding when adjusting the primary (top slug). Remove the resistor after adjustments are completed.

6. Tune the signal generator from 21 mc through 26.25 mc and observe the change in indication on the VTVM. If the generator output is set to the level where a 1.5 volt meter reading is obtained at the peak i-f amplifier response, the reading should not drop below one volt between the two peaks normally obtained with this i-f amplifier. If the bandpass response is unsatisfactory, repeat the procedure or try slight modifications of the recommended settings to obtain the desired results. Avoid resonating the coils with the iron core at the bottom end of the coil form (adjustment screw near limit of its travel). Final adjustments can be made much more easily if a sweep type signal generator and oscilloscope are used.

7. Check the two carrier i-f responses, 21.75 mc and 26.25 mc. The 21.75 mc response will be approximately 20 db below the peak response (approx. 0.15 volt) and the 26.25 mc response will fall approximately 6 db below the peak, (approx. 0.75 volt). Refer to Fig. 14.

To determine the i-f amplifier sensitivity, connect a signal generator to the OSC./MIXER tube as directed in step 2 of the I-F AMPLIFIER ALIGNMENT procedure. Set the generator frequency to either i-f peak. If a generator output of 800 to 1500 microvolts produces a one volt dc reading on a VTVM connected between terminal Ⓐ and ground, (Fig. 20) the i-f amplifier sensitivity is normal.

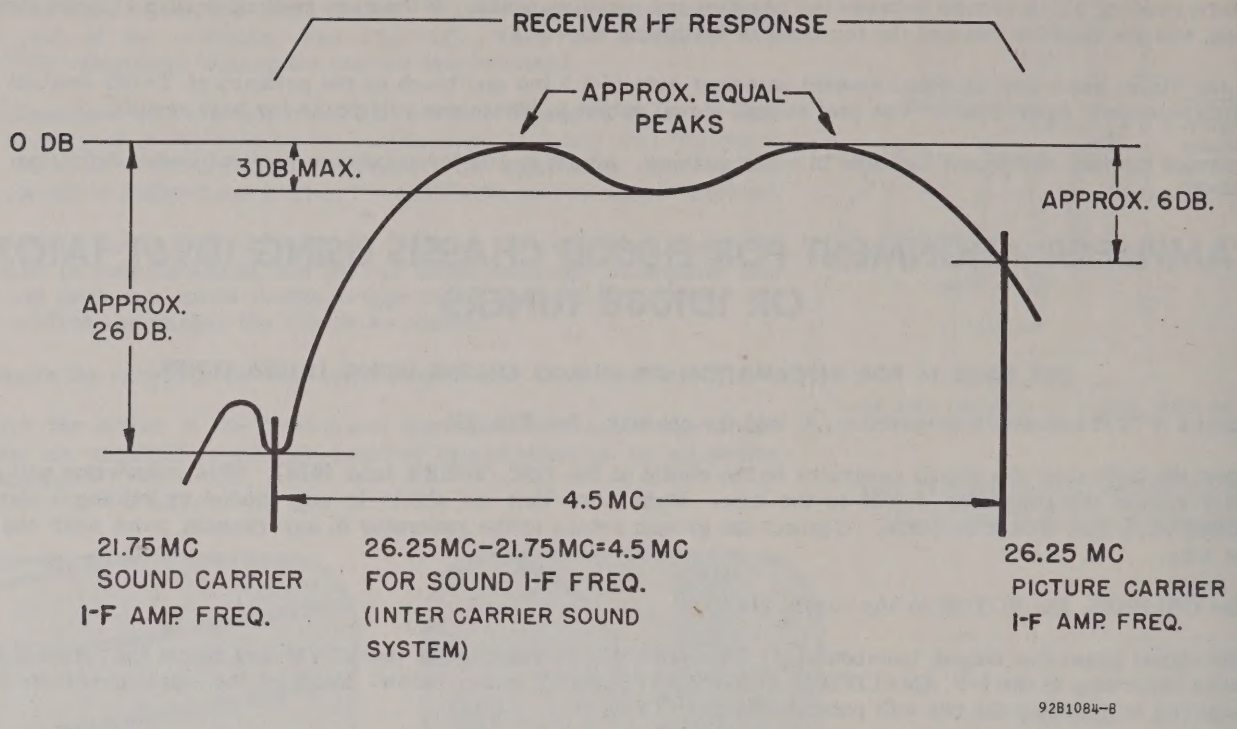

RECEIVER I-F RESPONSE
APPROX. EQUAL PEAKS
0 DB
3DB MAX.
APPROX. 6DB.
APPROX. 26 DB.
4.5 MC
21.75 MC SOUND CARRIER I-F AMP. FREQ.
26.25 MC-21.75 MC=4.5 MC FOR SOUND I-F FREQ. (INTER CARRIER SOUND SYSTEM)
26.25 MC PICTURE CARRIER I-F AMP. FREQ.
92B1084-8

Fig. 14. I-F Amplifier Response

TELEVISION CHANNELS vs. CARRIER, OSCILLATOR AND I-F FREQUENCIES

Channel No.	Channel Freq. (mc)	Picture Carrier Freq. (mc)	Sound Carrier Freq. (mc)	Receiver Osc. Freq. (mc)	Picture I-F Freq. (mc)	Sound I-F Freq. (mc)	Picture I-F less Sound I-F (mc)
2	54-60	55.25	59.75	81.5	26.25	21.75	4.5
3	60-66	61.25	65.75	87.5	26.25	21.75	4.5
4	66-72	67.25	71.75	93.5	26.25	21.75	4.5
5	76-82	77.25	81.75	103.5	26.25	21.75	4.5
6	82-88	83.25	87.75	109.5	26.25	21.75	4.5
7	174-180	175.25	179.75	201.5	26.25	21.75	4.5
8	180-186	181.25	185.75	207.5	26.25	21.75	4.5
9	186-192	187.25	191.75	213.5	26.25	21.75	4.5
10	192-198	193.25	197.75	219.5	26.25	21.75	4.5
11	198-204	199.25	203.75	225.5	26.25	21.75	4.5
12	204-210	205.25	209.75	231.5	26.25	21.75	4.5
13	210-216	211.25	215.75	237.5	26.25	21.75	4.5

1D961, 1A1077, OR 1D1088 TUNER ALIGNMENT (ANT. & RF CIRCUITS)

(SEE PAGES 16 & 17 FOR INFORMATION ON 1D1055 TUNER.)

The tuner, employing printed circuit coils, is of the turret type and covers channels 2 through 13. Its construction permits ease of adjustment and part replacement. It has been carefully aligned at the factory by personnel using precision equipment. Minor alignment adjustments of the tuner may be necessary after making tube or part replacements. For those service engineers who are properly equipped as specified, the following alignment procedure is included:

EQUIPMENT REQUIRED

1. Sweep Generator--RCA WR-59B or equivalent.
2. Marker Generator--RCA WR-39B Television Calibrator or equivalent.
3. Oscilloscope--RCA WO-57B or equivalent.
4. Vacuum Tube Voltmeter (VTVM)--RCA WV-97A Senior Voltohymst or equivalent.
5. Crystal Diode Circuit as shown in Fig. 15.

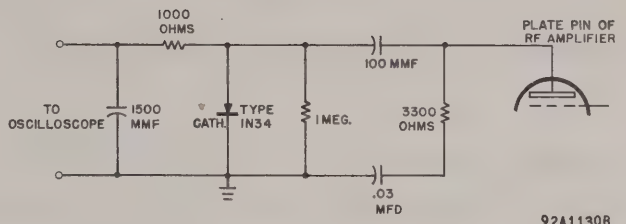


Fig. 15. Crystal Diode Circuit

SET-UP PROCEDURE

1. Connect all test equipment and the television receiver chassis to a common ground.
2. Connect the test circuit of Fig. 15 as shown in Fig. 16.
3. Apply a fixed bias to the tuner by connecting the positive pole of a 1.5 volt flashlight cell to the receiver chassis, and connecting the negative pole to terminal #1 of the tuner. (See Fig. 25 for tuner terminal identification).
4. Rotate C-10 and C-13 clockwise (fully in). See Fig. 20.

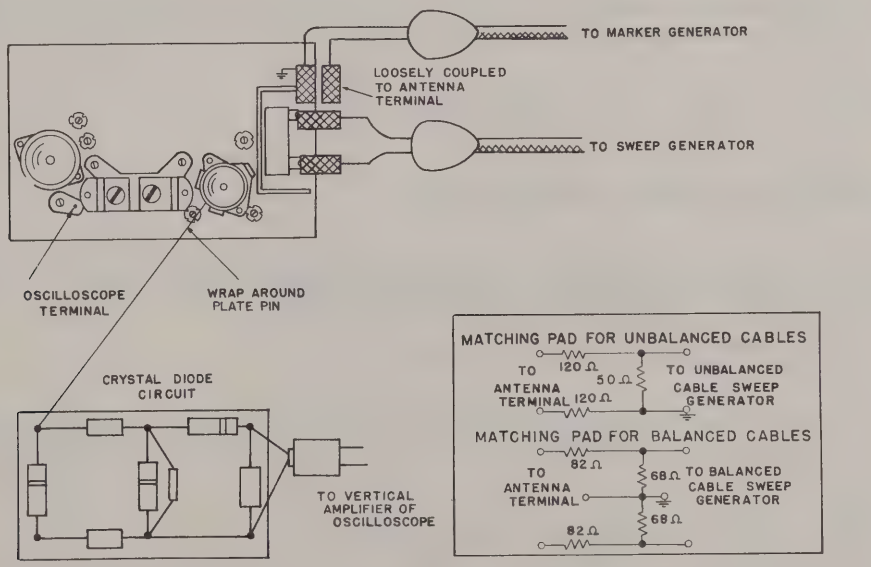


Fig. 16. TV Tuner Alignment Test Equipment Connections (For 1D961, 1A1077 and 1D1088 Units)

ANTENNA CIRCUIT ALIGNMENT

Refer to Figure 20 for location of all adjustments in this section and chart on page 10.

5. Set test equipment and tuner to channel 6 (82-88 mc).
6. Adjust C-7 for required response curve on the oscilloscope (Fig. 17A. Peak in center with marker pips down equally on either side of curve.
7. Tune test equipment and tuner to channel 7 (174-180 mc).
8. Adjust L-21 for required response curve on the oscilloscope (Fig. 17B). Peak in center with marker pips down equally on either side of curve.
9. If L-21 requires a large adjustment, repeat steps 5 through 8 until the required response curves are obtained.

10. Check the response curves on the low frequency channels (2-6). Readjust C-7 for a compromise response curve for each channel. Curves for each of these channels should be similar in appearance to Fig. 17A. Alignment is also complete if some curves resemble Fig. 17C and others resemble Fig. 17D; adjustment is necessary only if all curves for the low frequency channels are similar to just one of the two figures. Rotate C-7 clockwise to make the response curves more similar to Fig. 17C, or counterclockwise for more similarity to Fig. 17D.

11. Check the response curves on the high frequency channels (7-13). Readjust L-21 for a compromise response curve for each channel. Curves for each of these channels should be similar in appearance to fig. 17B. Alignment is also complete if some curves resemble Fig. 17E and others resemble Fig. 17F; adjustment is necessary only if all curves for the high frequency channels are similar to just one of the two figures. Rotate L-21 clockwise to make the response curves more similar to Fig. 17F, or counterclockwise for more similarity to Fig. 17E.

12. Remove the crystal diode circuit and connect the oscilloscope directly to the OSCILLOSCOPE TERMINAL (Fig. 20).

RF CIRCUIT ALIGNMENT

Refer to Fig. 20 for location of all adjustments in this section and chart on page 10.

13. Set tuner and test equipment to channel 6 (82-88 mc).

14. Adjust C-9, C-13 and C-22 to obtain a response curve on the oscilloscope similar to that shown as the normal one in Fig. 18. This may be accomplished in the following manner:

    a. Rotate C-13 counterclockwise approximately one-half turn.

    b. Refer to Fig. 18 to determine the effects of tuning C-9, C-13 and C-22. C-9 primarily controls the center frequency of the response curve. C-22 primarily controls tilt of the curve, and C-13 its bandwidth.

    c. It may be necessary to readjust C-22 after adjusting C-13.

15. Set tuner and test equipment to channel 12 (204-210 mc).

16. Adjust C-10, L-23 and L-48 to obtain a response curve on the oscilloscope similar to that shown as the normal curve in Fig. 19. This may be accomplished in the following manner.

    a. Rotate C-10 counterclockwise approximately one-half turn.

    b. Refer to Fig. 19 to determine the effects of tuning C-10, L-23 and L-48. L-23 primarily controls the center frequency of the response curve. L-48 primarily controls tilt of the curve and C-10 its bandwidth.

    c. It may be necessary to readjust L-48 after adjusting C-10.

17. Check the response curve for each channel, 2 through 6. Compromise adjustments on C-9, C-13 and C-22 may be necessary to obtain response curves similar to those shown in Fig. 21, for each channel.

    C-9 and C-22 have an effect on the response of channels 7 through 13. It may be necessary to include adjustment of these capacitors in the alignment of those channels. This should be done ONLY if two or more curves on the high channels slant in opposite directions. Care must be exercised so that the curves of channels 2 through 6 will not be thrown far out of line. A recheck of channels 2 through 6 may be necessary.

18. Check the response curve for each channel, 7 through 13. Compromise adjustments on C-10, L-23 and L-48 may be necessary to obtain response curves similar to those shown in Fig. 21 for each channel.

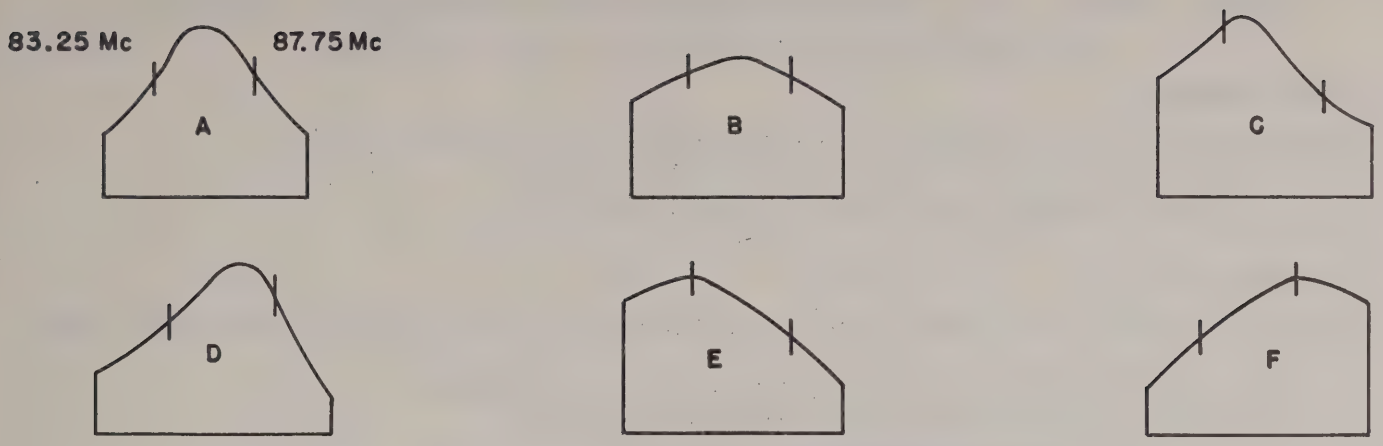


Fig. 17. TV Tuner Antenna Circuit Alignment Curves (For 1D961, 1A1077, and 1D1088 Units)

92B1169

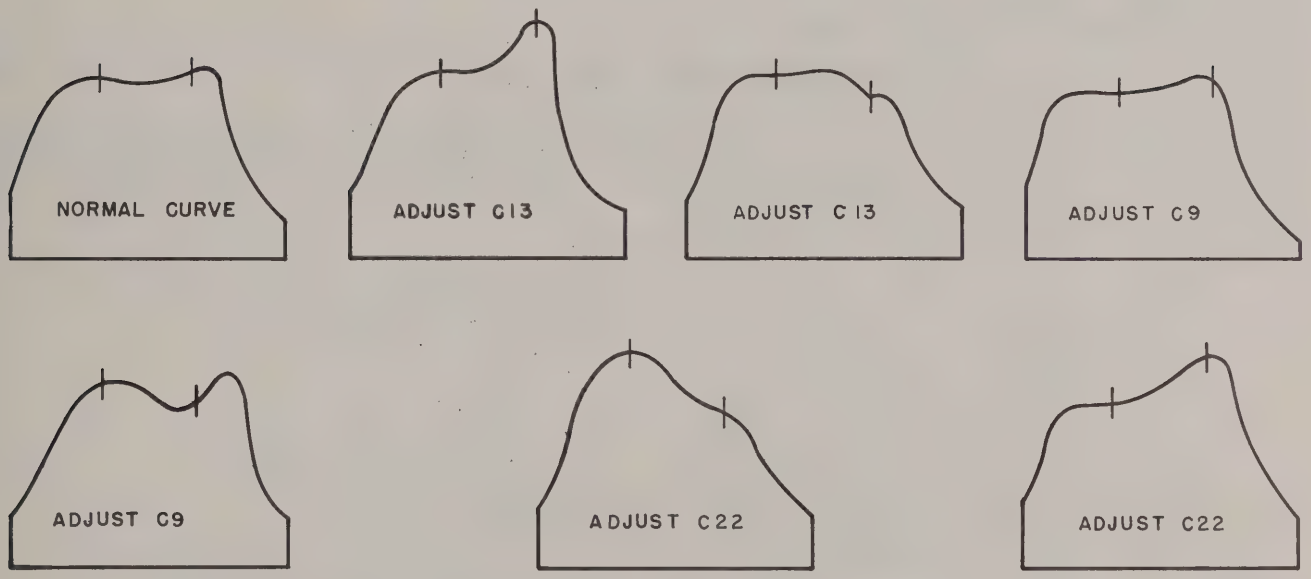


Fig. 18. TV Tuner RF Circuit Alignment Curves, Channels 2-6 (For 1D961, 1A1077, and 1D1088 Units)

92B1167

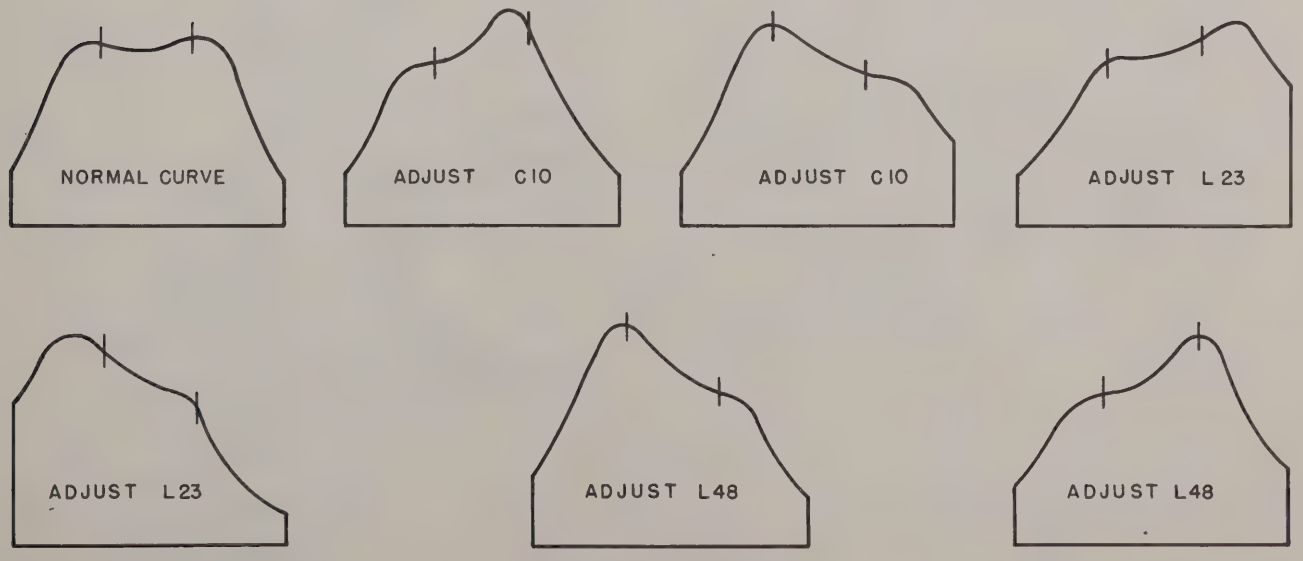


Fig. 19. TV Tuner RF Circuit Alignment Curves, Channels 7-13 (For 1D961, 1A1077, and 1D1088 Units)

92B1168A

1D961, 1A1077, OR 1D1088 TUNER ALIGNMENT (OSC. CIRCUIT)

(SEE PAGE 17 FOR INFORMATION ON 1D1055 TUNER OSC. CIRCUIT.)

EQUIPMENT REQUIRED

1. Sweep Generator covering the 54-88 mc and 174-216 mc ranges, with a sweep width of 0-10 mc
2. Marker Generator covering all sound carriers as shown in chart on page 10.
3. Marker Generator covering the sound intermediate frequency of 21.75 mc
4. Oscilloscope

SET-UP PROCEDURE

1. Connect the vertical input of the oscilloscope to terminal 5 of the tuner by means of the crystal diode circuit shown in Fig. 15.
2. Connect the sweep generator and the rf marker generator to the antenna terminals.
3. Connect the i-f marker generator to the vertical input of the oscilloscope.
4. Set the sweep width as necessary to give a good response curve.
5. Set the rf marker generator to the exact sound carrier frequency of the channel to which the receiver is tuned. (Start with channel 13.)
6. Set the i-f marker generator to 21.75 mc.
7. Set the FINE TUNING control to mid-range.
8. Adjust trimmer capacitor C-19 until the pips from the i-f and rf markers, as seen on the oscilloscope, coincide. These pips should separate as the FINE TUNING control is rotated.
9. Set the rf marker generator to exactly the sound carrier of each channel and adjust each oscillator inductance for coinciding marker pips on the oscilloscope. If any one channel has insufficient range, with individual oscillator adjustment, readjust C-19 to effect proper adjustment of this channel and then readjust all other individual adjustments (L-36 through L-47) for coinciding marker pips.
10. Recheck the antenna and rf response curves of Figs. 17 and 18.

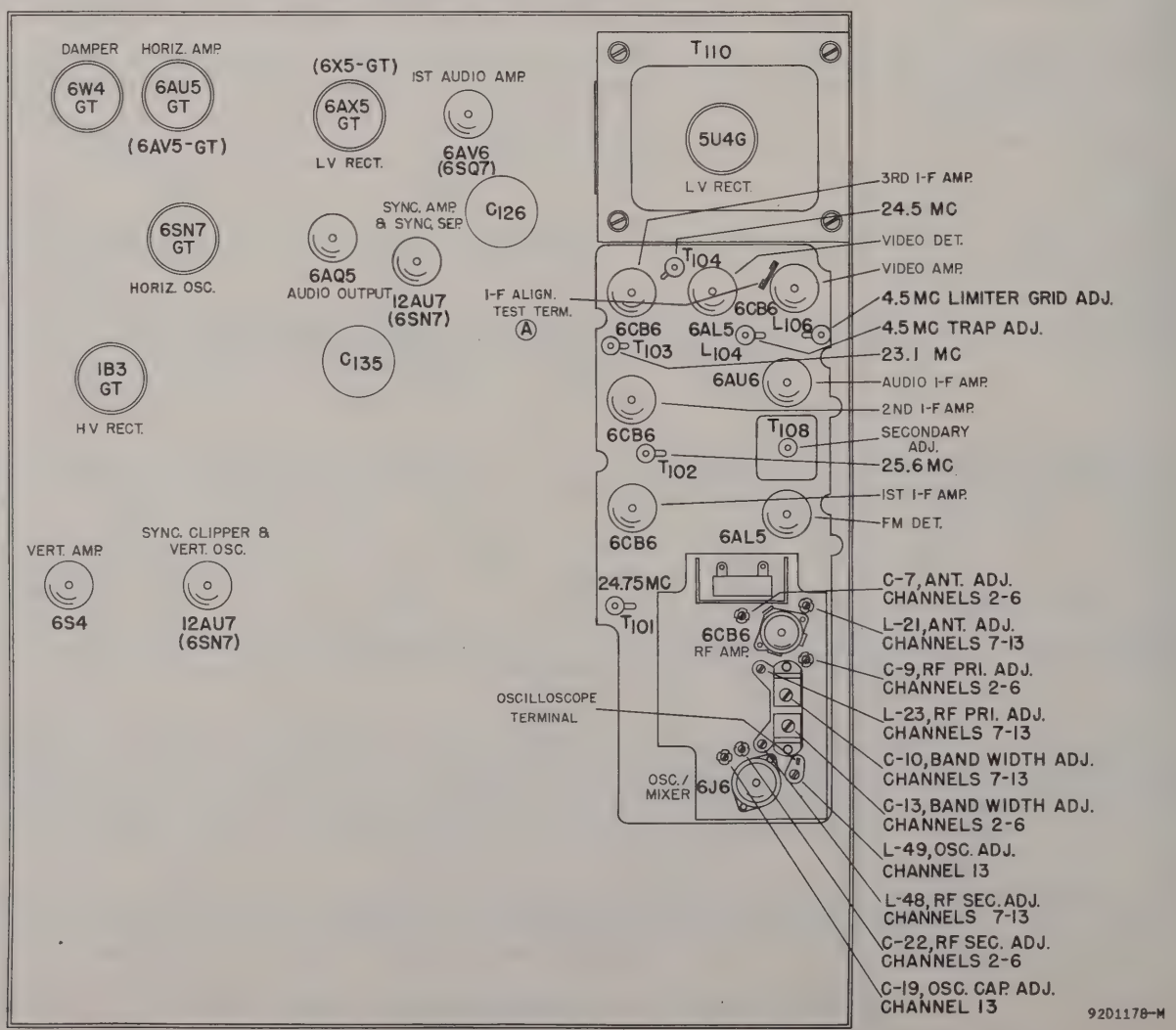


Fig. 20. Top View Alignment Locations with 1D961, 1A1077, or 1D1088 Tuner in Place

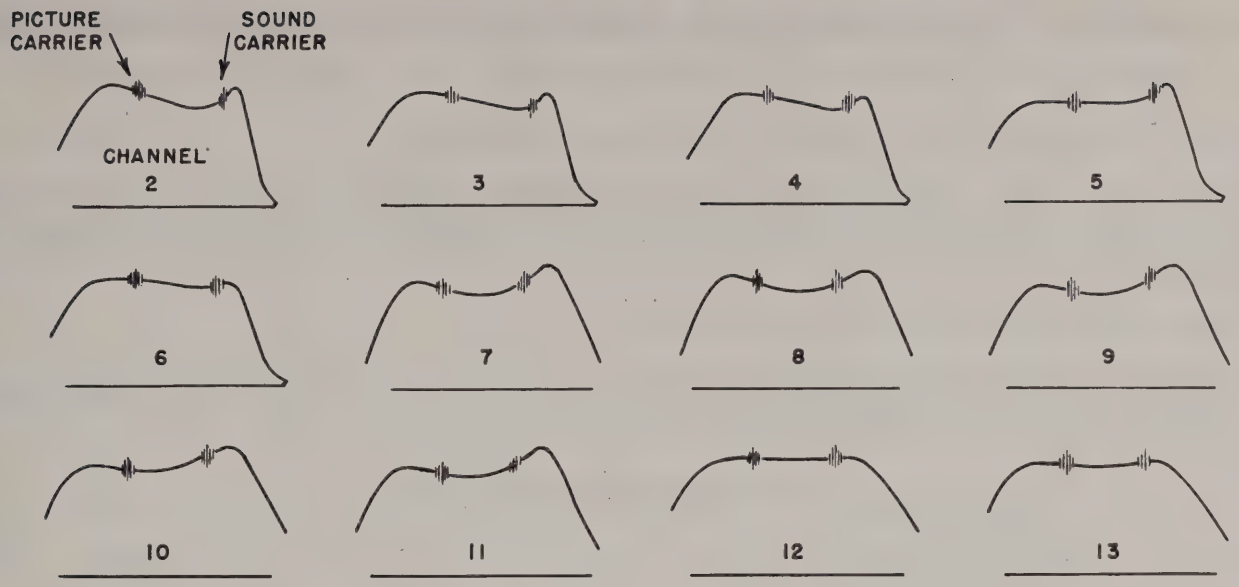


Fig. 21. TV Tuner Channel Response Curves

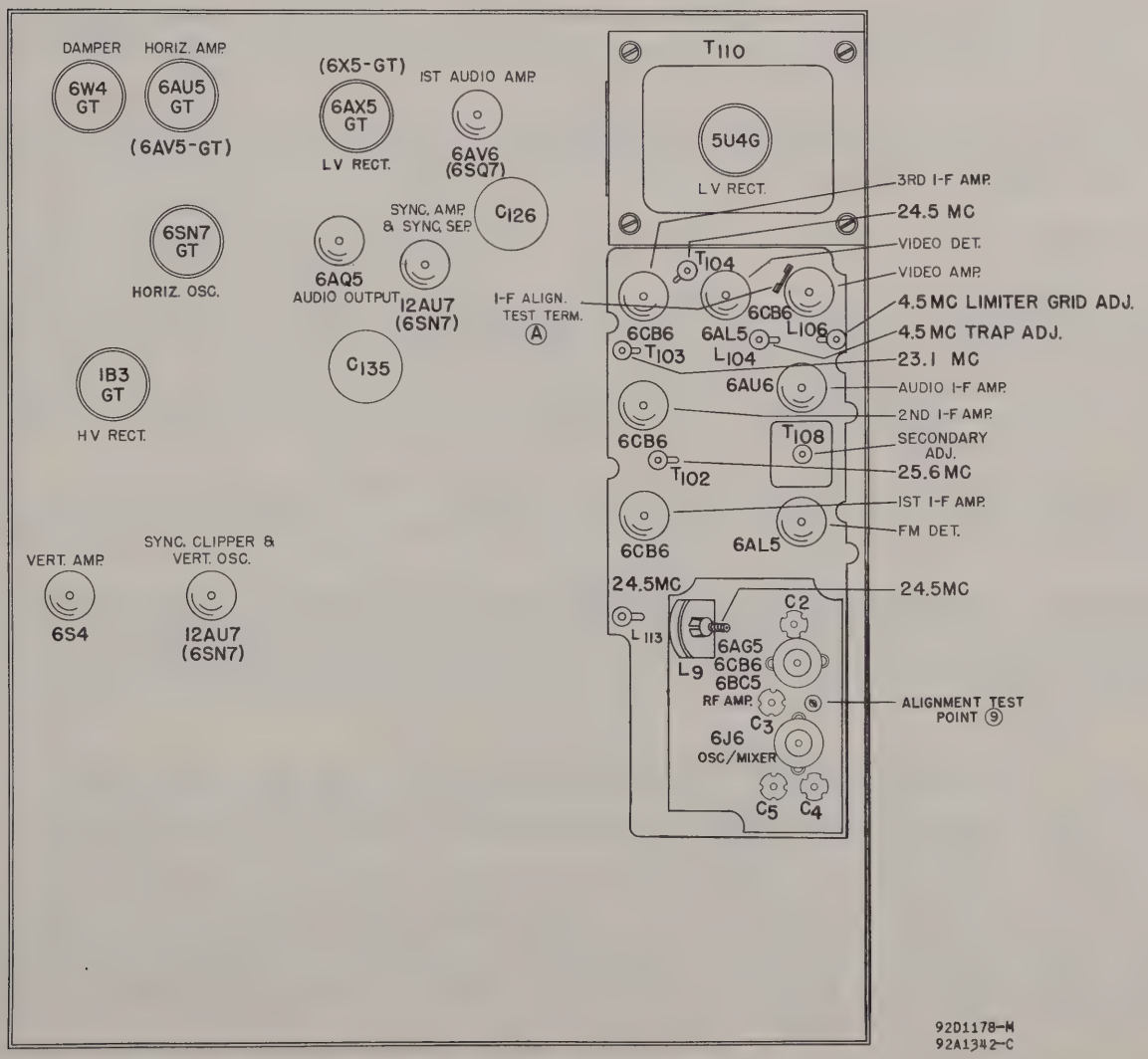


Fig. 22. Top View Alignment Locations (With 1D1055 Tuner in Place)

I-F AMPLIFIER ALIGNMENT FOR P1000D CHASSIS USING 1D1055 TUNER

(SEE PAGE 9 FOR INFORMATION ON E1000D CHASSIS USING 1D961, 1A1077, OR 1D1088 TUNER.)

1. Connect a VTVM between test terminal (A) and the chassis. (See Fig. 22.)

2. Connect the high side of a signal generator to the shield of the OSC/MIXER tube (6J6). This connection will capacitively couple the generator output to the tube. Make sure that the shield is ungrounded by raising it above the grounded clips that hold it in place. Connect the ground return of the generator to any chassis point near the base of the tube.

3. Set the CHANNEL SELECTOR to any vacant channel.

4. Set the signal generator output (unmodulated) for a two volt dc reading on the VTVM and adjust the three i-f transformers, L-113, and L-9, according to the I-F AMPLIFIER ALIGNMENT CHART shown below. Readjust the signal generator output as required to maintain the two volt potential at the VTVM.

I-F AMPLIFIER ALIGNMENT CHART

Signal Generator Frequency (No Modulation)	Adjustment	Location	VTVM Indication
25.6 mc	T-102 (top)	Fig. 22	Maximum
23.1 mc	T-103 (top)	Fig. 22	Maximum
24.5 mc	T-104 (top)	Fig. 22	Maximum
21.75 mc	T-103 (bottom)	Fig. 25	Minimum
24.5 mc	*L-113	Fig. 22	Maximum
24.5 mc	**L-9	Fig. 22	Maximum

*NOTE: Hold the CHANNEL SELECTOR between two channels when making this adjustment.

**NOTE: Return the CHANNEL SELECTOR to the normal position on any vacant channel and shunt the 4700 ohm grid resistor (R-101) of V-101 with a 1000 ohm resistor, when making this adjustment. Remove resistor after adjustment is completed.

5. After adjusting the 21.75 mc sound trap (bottom slug of T-103), recheck the setting of the top slug of T-103.

6. Tune the signal generator from 21 mc through 26.25 mc and observe the change in indication on the VTVM. If the generator output is set to the level where a 1.5 volt meter reading is obtained at the peak i-f amplifier response, the reading should not drop below one volt between the two peaks normally obtained with this i-f amplifier. If the band-pass response is unsatisfactory, repeat the procedure or try slight modifications of the recommended settings to obtain the desired results. Avoid resonating the coils with the iron core at the bottom end of the coil form (adjustment screw near limit of its travel). Final adjustments can be made much more easily if a sweep type signal generator and oscilloscope are used.

7. Check the two carrier i-f responses, 21.75 mc and 26.25 mc. The 21.75 mc response will be approximately 20 db below the peak response (approx. 0.15 volt) and the 26.25 mc response will fall approximately 6 db below the peak, (approx. 0.75 volt). Refer to Fig. 14.

To determine the i-f amplifier sensitivity, connect a signal generator to the OSC./MIXER tube as directed in step 2 of the I-F AMPLIFIER ALIGNMENT procedure. Set the generator frequency to either i-f peak. If a generator output of 800 to 1500 microvolts produces a one volt dc reading on a VTVM connected between terminal (A) and ground (Fig. 22), the i-f amplifier sensitivity is normal.

1D1055 TUNER ALIGNMENT (ANT. & RF CIRCUITS)

(SEE PAGES 11 & 12 FOR INFORMATION ON 1D961, 1A1077, OR 1D1088 TUNER.)

The tuner was carefully aligned at the factory and should not require complete realignment under normal operating conditions. A slight readjustment of the individual oscillator slugs may be required as the tubes in the tuner age or are replaced. In some rare cases it will be necessary to realign the tuner after replacing either of the two tubes. If any service work is performed on the tuner, realignment may or may not be required. NO ATTEMPT TO REALIGN THE TUNER SHOULD BE MADE UNTIL THE BALANCE OF THE TV RECEIVER IS KNOWN TO BE IN PROPER OPERATING CONDITION AND IS PROPERLY ALIGNED.

When replacing the rf amplifier tube, use the same type tube as the one found in the tuner. The other alternate tubes may be used for V-1 (page 3) but the use of a tube other than the type found in the tuner may make it necessary to realign the rf and mixer portion of the tuner.

1D1055 TUNER ALIGNMENT (ANT. & RF CIRCUITS) (Cont.)

EQUIPMENT REQUIRED

1. Sweep generator covering all 12 television channels
2. Marker generator covering the same range as the sweep generator.
3. Signal generator which has an output (unmodulated) on 26.25 mc.
4. Oscilloscope.
5. Vacuum tube voltmeter (VTVM)

SET-UP PROCEDURE

1. Set the CHANNEL SELECTOR switch to channel 12.
2. Connect the oscilloscope through a 10,000 ohm resistor to test point 9. (See Schematic Diagram).
3. Connect the negative pole of a 1.5 volt dry cell to the terminal where the AGC lead (white wire) from the tuner and one lead from R-101 are connected. (See Schematic Diagram). Connect the politive pole of the dry cell to the receiver chassis.
4. Set the FINE TUNING control at the approximate midpoint of its tuning range.
5. Connect the sweep generator to the antenna terminals and adjust the output to sweep channel 12.
6. Loosely couple the output from the marker generator to the antenna terminals. Use the minimum amount of coupling and signal from the marker generator required to give a good marker or pip on the oscilloscope pattern.

ALIGNMENT PROCEDURE

7. Adjust C-2, C-3 and C-4 for a flat-top response curve and maximum gain. Check markers on all channels. They should fall in automatically on each channel. Correct marker frequencies for each channel are given in the Picture Carrier and Sound Carrier columns of the chart on page 10.
8. Disconnect the battery used to obtain negative bias.
9. Disconnect the test equipment and air check the receiver on all active channels. If it is possible to receive a normal picture on all active channels by adjusting the FINE TUNING control, further alignment will not be necessary.

1D1055 TUNER ALIGNMENT (OSC. CIRCUIT)

(SEE PAGE 14 FOR INFORMATION ON 1D961, 1A1077, OR 1D1088 TUNER OSC. CIRCUIT.)

1. Set the FINE TUNING control at the approximate midpoint of its tuning range.
2. Place a non-metallic screwdriver through the openings provided in the front of the chassis and the tuner assembly and adjust the oscillator coil slug for each active channel to give the best possible picture.

If the oscillator slug adjustment does not have sufficient range to tune in a good picture on any active channel it will be necessary to adjust C-5. The procedure for this adjustment is as follows:

WITH INSTRUMENTS

3. Set the CHANNEL SELECTOR switch to channel 12.
4. Connect the marker generator to one antenna terminal and ground. Set generator to 209.75 mc.
5. Connect the output of another signal generator to point Ⓐ through a 47,000 ohm resistor and adjust the generator frequency to 26.25 mc.
6. Connect the VTVM to point Ⓒ (See Schematic Diagram) and adjust C-5 for a zero reading on the VTVM between a positive and negative peak.
7. Use only sufficient output from the signal generators to obtain a useable meter reading.
8. Repeat steps 1 and 2.
9. Repeat steps 3 through 8 if necessary.

WITHOUT INSTRUMENTS

3. Set the CHANNEL SELECTOR switch to any active channel on which a picture or test pattern can be received. Preferably select a station operating on the highest frequency or channel.
4. Adjust C-5 for the best possible picture.
5. Repeat steps 1 and 2.
6. Repeat steps 3 through 5 if necessary.

SERVICE PARTS LIST FOR 1D1055 TUNER

Hallicrafters Part Number	Description	Hallicrafters Part Number	Description
121A001	Fine tuning assembly shaft & cam	121A020	Channel 7 r-f & osc. coil
121A002	Drum & shaft assembly, less coils	121A021	Channel 8 r-f & osc. coil
121A003	Channel 2, antenna coil	121A022	Channel 9 4-f & osc. coil
121A004	Channel 3 antenna coil	121A023	Channel 10 r-f & osc. coil
121A005	Channel 4 antenna coil	121A024	Channel 11 r-f & osc. coil
121A006	Channel 5 antenna coil	121A025	Channel 12 r-f & osc. coil
121A007	Channel 6 antenna coil	121A026	Channel 13 r-f & osc. coil
121A008	Channel 7 antenna coil	121A027	Detent roller
121A009	Channel 8 antenna coil	121A028	Fiber washer
121A010	Channel 9 antenna coil	121A029	Spring, fine tuning ground
121A011	Channel 10 antenna coil	121A030	Spring, shaft retaining (2 req.)
121A012	Channel 11 antenna coil	121A031	Spring, detent
121A013	Channel 12 antenna coil	121A032	L-9 peaking coil
121A014	Channel 13 antenna coil	121A033	Slug, osc. coil adjustment
121A015	Channel 2 r-f & osc. coil	121A034	Spring, osc. coil slug retaining
121A016	Channel 3 r-f & osc. coil	121A035	Stator contact assembly
121A017	Channel 4 r-f & osc. coil	121A036	Fine tuning capacitor plate
121A018	Channel 5 r-f & osc. coil	121A037	Spring, detent ground
121A019	Channel 6 r-f & osc. coil		

NOTE: The last two digits of the part numbers shown in the Service Parts List are used to identify the corresponding part in the illustration below.

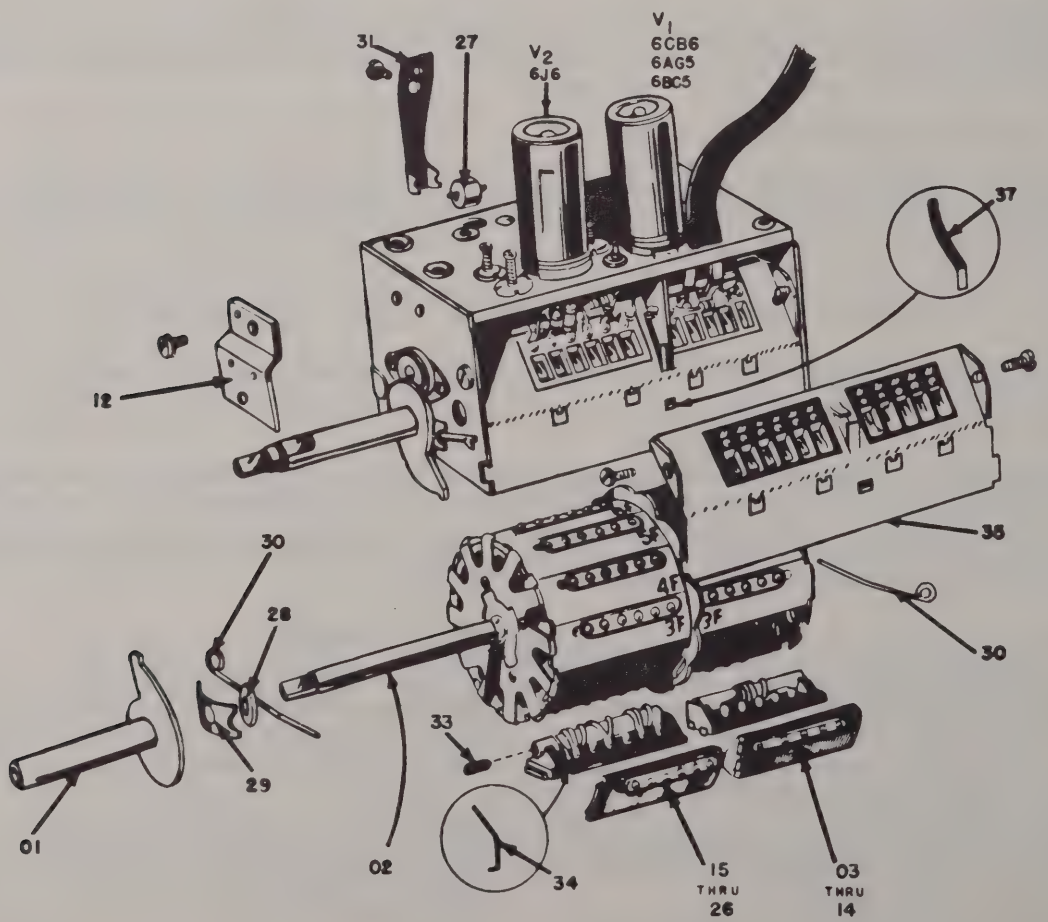


Fig. 23. 1D1055 Tuner Replaceable Parts

9281384

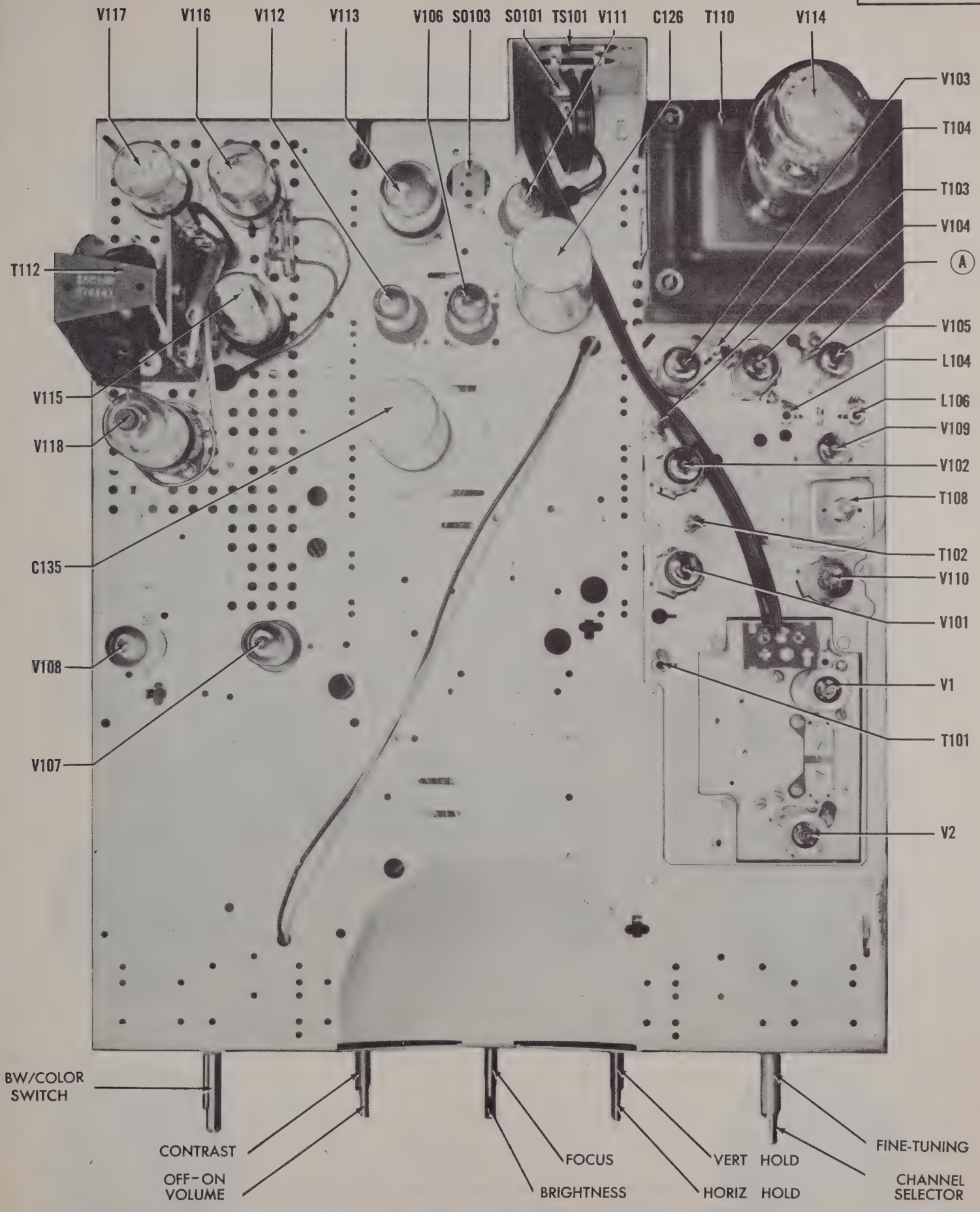


Fig. 24. Top View of E1000D Chassis with 1D961, 1A1077, or 1D1088 Tuner

92X1600-A

The top view of the P1000D chassis is the same as the above illustration except for the tuner, and T-101 is replaced by L-113.

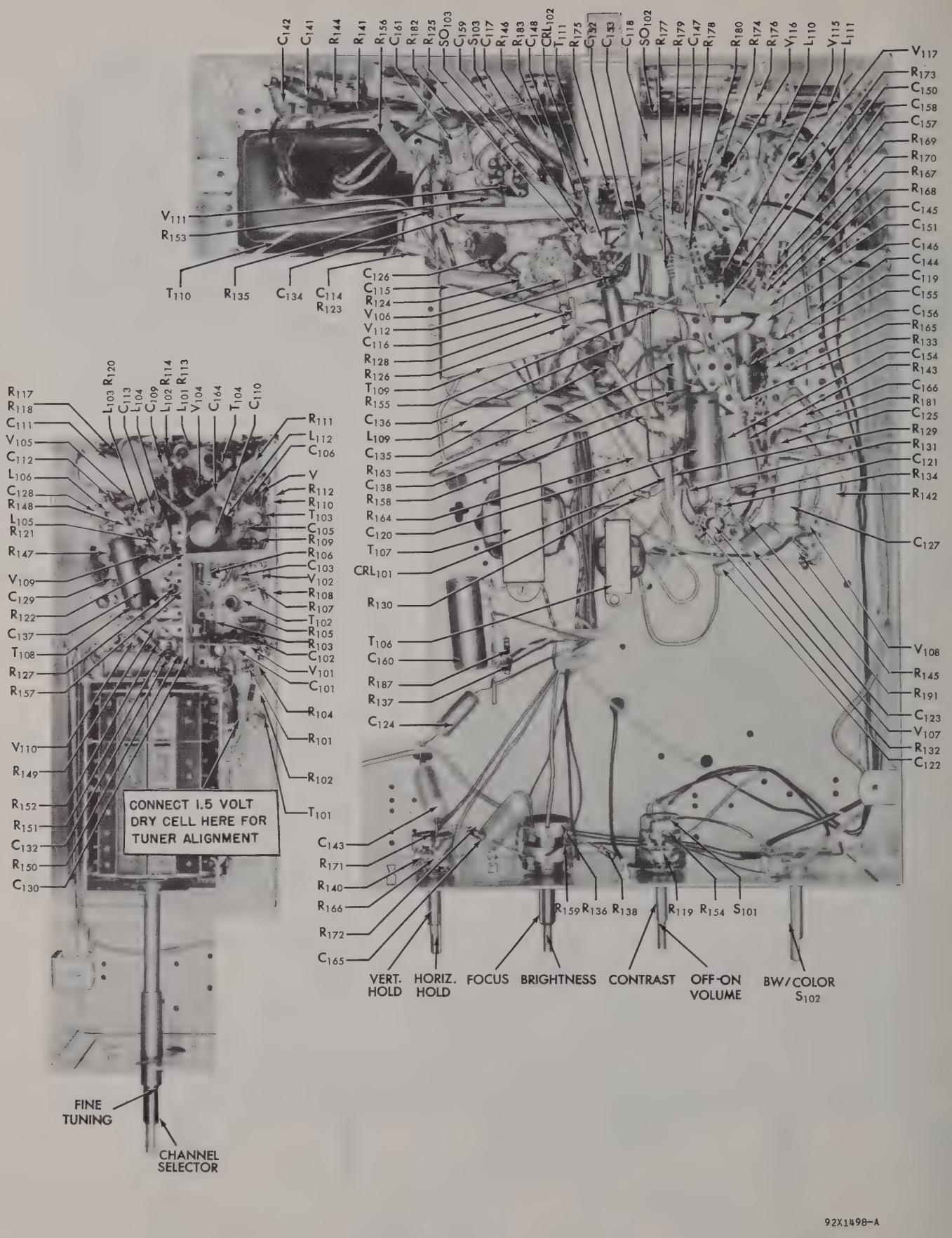


Fig. 25. Bottom View of E1000D Chassis with 1D961, 1A1077, or 1D1088 Tuner

A nine pin color adapter socket, not shown in the above illustration, will be found on the E1000D & P1000D chassis. The bottom view of either chassis is the same except for the tuner and T-101 is replaced by L-113 in the P1000D chassis.

TYPICAL OSCILLOSCOPE PATTERNS

The patterns given on the following pages are presented as a guide when using an oscilloscope to locate trouble in the video amplifier, sync., horizontal oscillator, horizontal output, vertical oscillator, and vertical output stages of the tv receiver.

Considerable variation may be noted in the amplitude and shape of some of the various waveforms from one receiver to the next. As long as the waveform obtained from the receiver under test contains the same general characteristics as those shown in the illustrations and the relative amplitude is within approximately 25% of the peak to peak voltage or relative amplitude shown below each waveform the pattern obtained may be assumed to be correct. The patterns are observed with the tv receiver tuned to an active channel and the controls adjusted for the best possible picture.

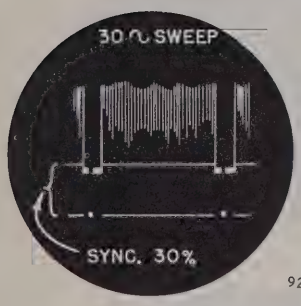
The waveforms shown in the illustrations were obtained on a Dumont type 304 oscilloscope which was used in conjunction with a low capacity 10 to 1 probe such as the Tel-Instrument Co. type 1610. Other types of oscilloscopes will account for a certain amount of variation in the amplitude and shape of the patterns obtained from the actual receiver under test. A low capacity probe must be used in order to obtain satisfactory results.

With the exception of the test pattern obtained across the vertical yoke all patterns are taken with the ground side of the oscilloscope connected to the ground or chassis of the tv chassis and the 10 to 1 probe connected to the specific points in the tv chassis as specified by each pattern.

The patterns obtained from the horizontal amplifier plate, damper cathode, horizontal output transformer, and the high voltage rectifier tube must be observed by means of the high voltage probe which is made from a type 1X2-A tube as shown in Fig. 26. The tube is used as a high voltage coupling capacitor. Use a new tube for this application because the loose filament of a burned out one may touch the plate. These patterns are also shown with their relative amplitudes indicated with respect to the pattern obtained at terminal (or tap) 4 of T-112 which is given a unit value of one.

At certain points throughout the tv receiver the oscilloscope pattern obtained will be dependent upon the frequency of the horizontal sweep oscillator in the oscilloscope. The oscilloscope sweep frequency must be either 30 cps (1/2 of the tv vertical oscillator frequency) or 7875 cps (1/2 of the tv horizontal oscillator frequency) depending upon the pattern desired. The sweep frequency required to obtain the patterns shown is given with each pattern.

VIDEO AMPLIFIER



92C1500
1

V-105 Video Amp. grid (Pin 1)

V-105 Video Amp. plate (Pin 5). Adjust the contrast control to give a 40 volt peak to peak reading.

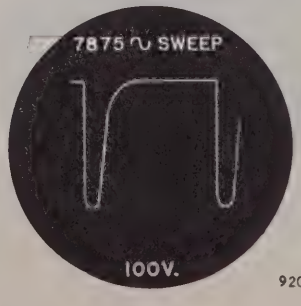
92C1500
7

SYNC. AMPLIFIER, SEPARATOR AND CLIPPER

92C1500
8

V-106 Sync. Amp. grid (Pin 2)

V-106 Sync. Amp. plate (Pin 1)



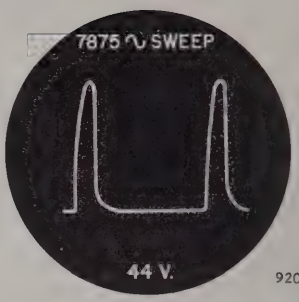
92C1500
9

SYNC. AMPLIFIER, SEPARATOR AND CLIPPER (Cont.)

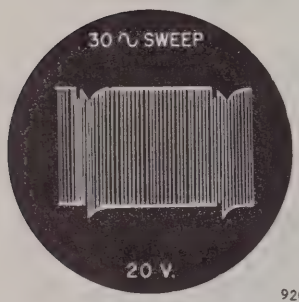
92C1500
10

V-106 Sync.
Sep. plate (Pin 6)

V-107 Sync.
Clipper plate (Pin 1)



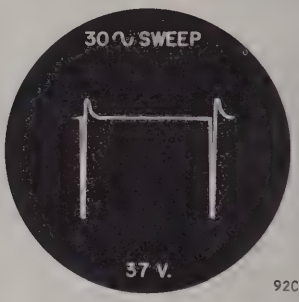
92C1501
4



92C1501
2

Input to Vertical
Integrating Network.
(CRL-101)

Cathode Ray Tube
V-119 grid (Pin 2)



92C1501
3

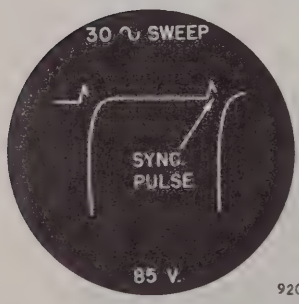
VERTICAL OSCILLATOR AND VERTICAL AMPLIFIER

92C1502
3

V-107 Vert.
Osc. grid (Pin 7)

V-107 Vert.
Osc. plate (Pin 6)

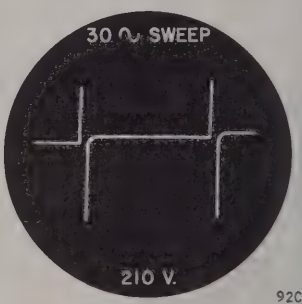
92C1502
4



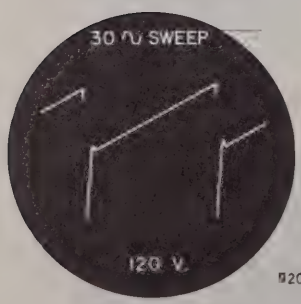
92C1502
1

T-106 Vert. Osc.
Transformer
Yellow lead

T-106 Vert. Osc.
Transformer
Green lead



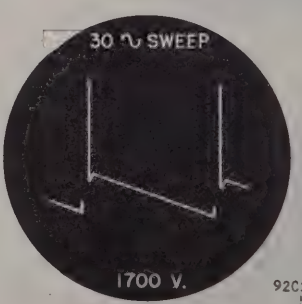
92C1502
2



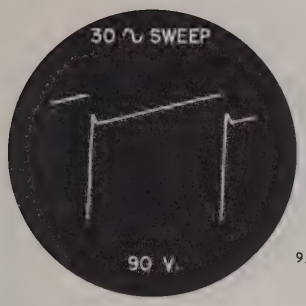
92C1502
9

V-108 Vert.
Amp. grid (Pin 6)

V-108 Vert.
Amp. plate (Pin 9)



92C1502
5



92C1502
10

Vert. Deflection Yoke
(Connect to Red and
Green wires of T-107)

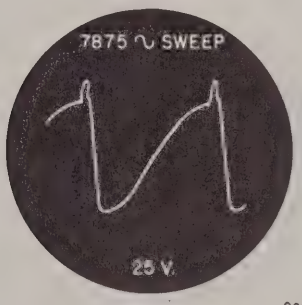
NOTE: When observing this test pattern the oscilloscope must not be grounded since the ground side of the 'scope is connected to B+ of the tv power supply. Do not touch the tv chassis and the 'scope during this observation as a severe shock will result.

HORIZONTAL OSCILLATOR

92C1503
2

Junction of C-119,
C-151 and C-156

V-115 Horiz. Osc.
grid (Pin 1)

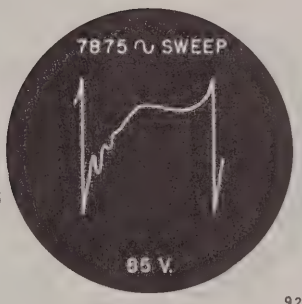


92C1503
3

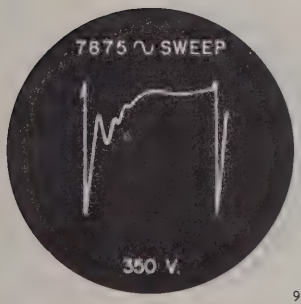
92C1503
5

V-115 Horiz. Osc.
cathode (Pin 3)

Junction of R-168,
R-169, R-170 and R-173



92C1503
6



92C1503
7

V-115 Horiz. Osc.
grid (Pin 4)

V-115 Horiz. Osc.
plate (Pin 5)

92C1503
8

92C1503
9

Horiz. Osc. Trans.
T-111 Terminal C

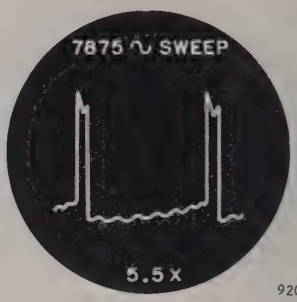
Horiz. Osc. Trans.
T-111 Terminal D

92C1503
10

HORIZONTAL AMPLIFIER, HORIZONTAL OUTPUT TRANSFORMER, DAMPER, AND HIGH VOLTAGE RECTIFIER

NOTE: Before endeavoring to view the following waveforms read the notes and instructions at the beginning of this section pertaining to waveforms. The high voltage probe shown below will have to be used.

V-116 Horiz, Amp. plate (Pin 5)

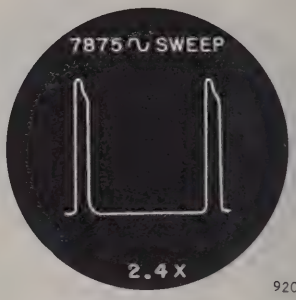


92C1504 7

92C1504 1

Horiz. Output Trans. T-112 Terminal 4

Horiz. Output Trans. T-112 Terminal 5

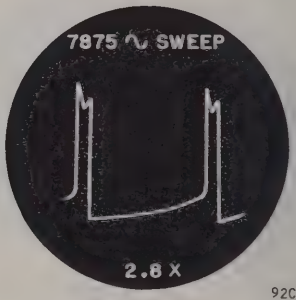


92C1504 2

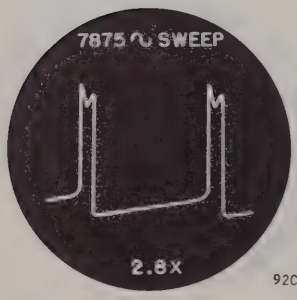
92C1504 3

Horiz. Output Trans. T-112 Terminal 7

Horiz. Output Trans. T-112 Terminal 8



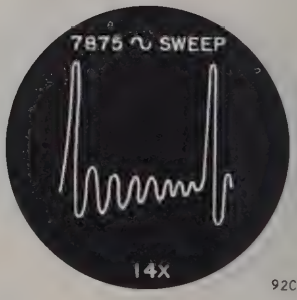
92C1504 5



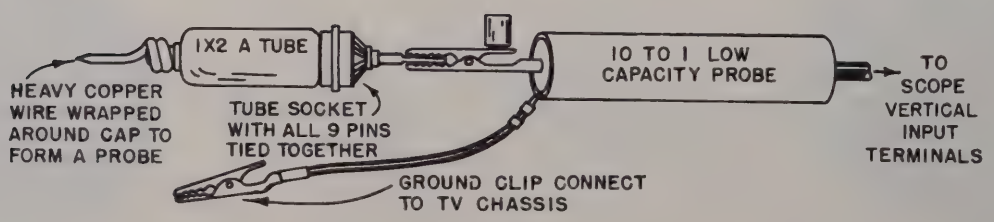
92C1504 4

V-117 Damper cathode (Pin 3)

V-118 High Volt. Rect. plate (cap)



92C1504 6


1X2 A TUBE
10 TO 1 LOW CAPACITY PROBE
TO SCOPE VERTICAL INPUT TERMINALS
HEAVY COPPER WIRE WRAPPED AROUND CAP TO FORM A PROBE
TUBE SOCKET WITH ALL 9 PINS TIED TOGETHER
GROUND CLIP CONNECT TO TV CHASSIS

92C1504 8

FIG. 26. HIGH VOLTAGE PROBE FOR WAVEFORM OBSERVATIONS

SERVICE PARTS LIST

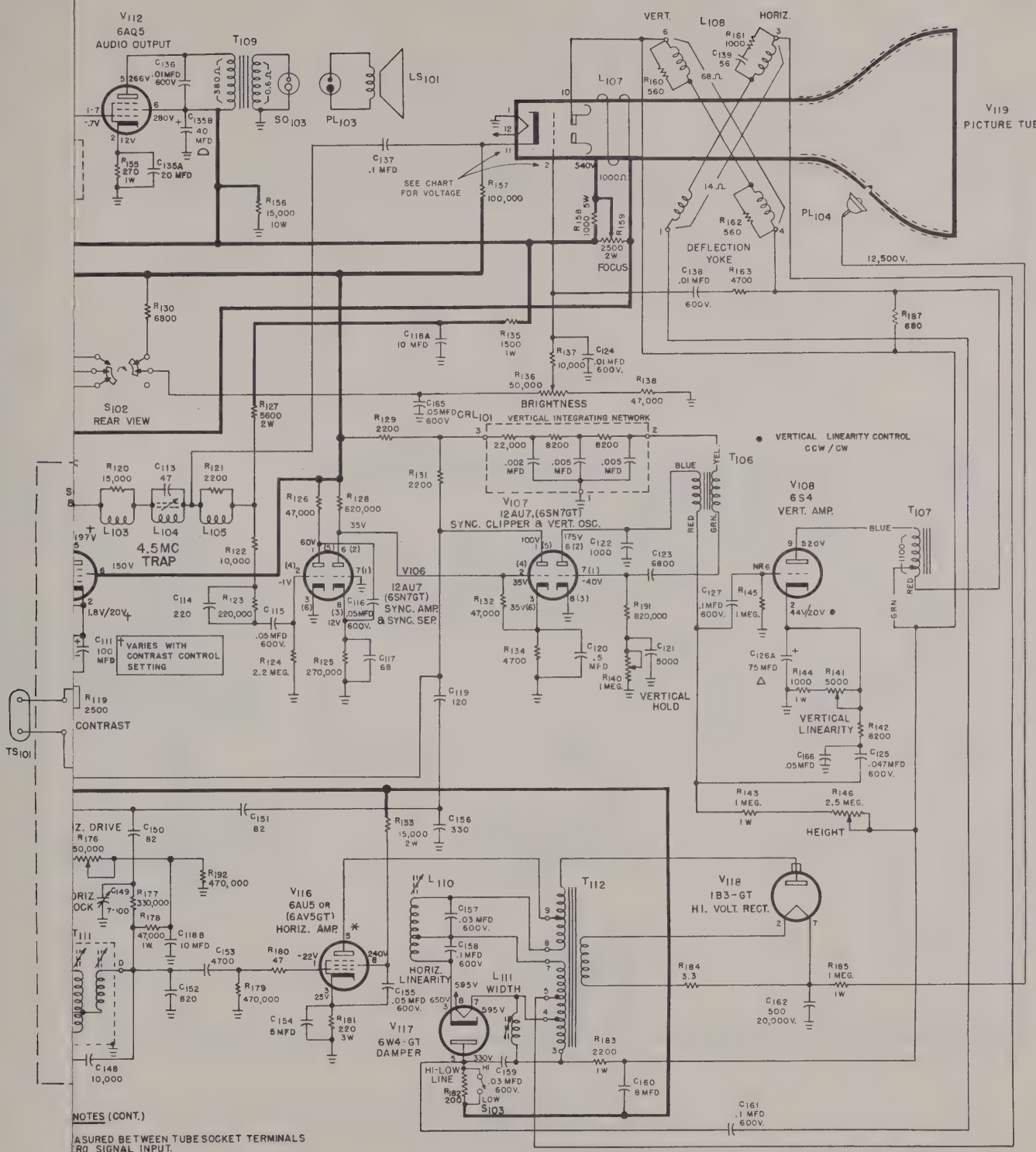
Schematic Symbol	Description	Hallicrafters Part Number
	TRANSFORMERS AND COILS	
T-101	Transformer, mixer i-f (used only with 1D961, 1A1077, or 1D1088 tuner)	51B1334
T-102	Transformer, 1st i-f amplifier	50A475
T-103	Transformer, 2nd i-f amplifier	51B1332 or 50A476
T-104	Transformer, 3rd i-f amplifier	50A477
T-106	Transformer, vertical oscillator	55C115
T-107	Transformer, vertical output	55B151
T-108	Transformer, ratio detector	50C473
T-109	Transformer, audio output	55B150
T-110	Transformer, power	52C204
T-111	Transformer, horizontal oscillator	51B1242
T-112	Transformer, horizontal output	55C149
L-101	Coil, video peaking (wound on R-113)	51A1256
L-102	Coil, video peaking (wound on R-114)	51A1260
L-103	Coil, video peaking (wound on R-120)	51A1257
L-104,106	4.5 MC TRAP, LIMITER GRID adjustment	51B1333 or 50B474
L-105	Coil, video peaking (wound on R-121)	51A1259
L-107	Coil, FOCUS	51B1246 or 51-1372
L-108	Deflection yoke	53-237
L-109	Choke, filter	56C116
L-110	Coil, HORIZONTAL LINEARITY	51B1331 or 51B1340
L-111	Coil, WIDTH control	51B1330 or 51B1341
L-112	Choke, heater	53A200
L-113	Coil, mixer i-f (used only with 1D1055 tuner)	51B1301
L-114	Choke, r-f	53B008
	CAPACITORS	
CRL-101	Vertical integrating network	49A015
CRL-102	Audio coupling network	49A017
C-101,102,103, 104,106,107, 121,163,164	5000 mmf. 450 V., ceramic	47A168
C-108	10 mmf. 500 V., ceramic	47B20100K5
C-109,110	.5 mfd. 25 V., tubular	46A177
C-111	100 mfd. 10 V., electrolytic	45B170
C-112	2.2 mmf. 500 V., ceramic	47A160-4
C-113,128	47 mmf. 500 V., ceramic (part of L-104 & L-106)	---
C-114	220 mmf. 500 V., mica	47X20B221K
C-115,116,143, 146,155,165	.05 mfd. 600 V., tubular	46AY503J
C-117	68 mmf. 500 V., ceramic	47B20680K5
C-118	Dual 10 mfd. 450 V., electrolytic	45A172
C-119	120 mmf. 500 V., mica	47X20B121K
C-120,144	.5 mfd. 200 V., tubular	46AT504J
C-122,130	1000 mmf. 500 V., ceramic	47B20A102M5
C-123	6800 mmf. 500 V., mica	47X35B682K
C-124,134,136, 138	.01 mfd. 600 V., tubular	46AY103J
C-125	.047 mfd. 600 V., tubular	46BR473L6
C-126	60-40 mfd. 450 V., 75 mfd. 50 V., electrolytic	45B173
C-127,158,161	.1 mfd. 600 V., tubular	46AX104J
C-129	Dual 4000 mmf. 450 V., ceramic	47A218
C-132,154	5 mfd. 50 V., electrolytic	45B175
C-133	330 mmf. 500 V., ceramic	47B20331K5 or 47B20A331M5
C-135	40-40 mfd. 250 V., 40 mfd. 450 V., 20 mfd., 25 V., electrolytic	45B174
C-137	.1 mfd. 200 V., tubular	46AU104J
C-139	56 mmf. 500 V., mica (part of L-108)	---
*C-141,142	.01 mfd. 600 V., tubular	46BR103J6 or 46A178
C-145	.02 mfd. 600 V., tubular	46AY203J
C-147,156	330 mmf. 500 V., mica	47X20B331K
*C-148	.01 mfd. 400 V., tubular	46BR103E4
C-149	Trimmer, HORIZONTAL LOCK control	44A391
C-150,151	82 mmf. 500 V., mica	47X20B820K
C-152	820 mmf. 500 V., mica	47X25B821K
C-153	4700 mmf. 500 V., mica	47X35B472K
C-157,159	.03 mfd. 600 V., tubular	46AY303J
C-160	8 mfd. 475 V., electrolytic	45A103
C-162	500 mmf. 20,000 V., ceramic	47A223
C-166	.05 mfd. 200 V., tubular	46AU503J
C-167	5 mmf. 500 V., ceramic	47B20050K5
	RESISTORS	
R-101,134,163	4700 ohms 1/2 watt, carbon	23X20X472K
R-102,108,110, 111	100 ohms 1/2 watt, carbon	23X20X101K
R-103,106,112, 118,147	150 ohms 1/2 watt, carbon	23X20X151K
R-104,107,180	47 ohms 1/2 watt, carbon	23X20X470K
R-105,174	12,000 ohms 1/2 watt, carbon	23X20X123K
R-109,122,137	10,000 ohms 1/2 watt, carbon	23X20X103K
R-113	6800 ohms 1/2 watt, carbon (part of L-101)	---
R-114,121	2200 ohms 1/2 watt, carbon (part of L-102 & L-105)	---
R-115,145	1 megohm 1/2 watt, carbon	23X20X105M
R-116	3300 ohms 1/2 watt, carbon	23X20X332K
R-117,123	220,000 ohms 1/2 watt, carbon	23X20X224M
R-119,154	1 megohm/2500 ohms; OFF-ON-VOLUME/CONTRAST control	25B898
R-120	15,000 ohms 1/2 watt, carbon (part of L-103)	---
R-124	2.2 megohms 1/2 watt, carbon	23X20X225M
R-125,194	270,000 ohms 1/2 watt, carbon	23X20X274M
R-126,132,138	47,000 ohms 1/2 watt, carbon	23X20X473K
R-127	5600 ohms 2 watts, carbon	23X40X562K
R-128	820,000 ohms 1/2 watt, carbon	23X20X824M
R-129,131,193	2200 ohms 1/2 watt, carbon	23X20X222K
R-130	6800 ohms 1/2 watt, carbon	23X20X682K
R-133	15,000 ohms 2 watts, carbon	23X40X153K
R-135	1500 ohms 1 watt, carbon	23X30X152K
R-136,159	2500/50,000 ohms; FOCUS-BRIGHTNESS control	25B895
R-140,171	1 megohm/50,000 ohms: VERTICAL-HORIZONTAL HOLD control	25B917
R-141	5000 ohms; VERTICAL LINEARITY control	25B712
R-142,175	8200 ohms 1/2 watt, carbon	23X20X822K
*R-143	1 megohm 1 watt, carbon	23X30BF105M
R-144	1000 ohms 1 watt, carbon	23X30X102K
R-146	2.5 megohms; HEIGHT control	25B711
R-148	22,000 ohms 1/2 watt, carbon	23X20X223K
R-149	270 ohms 1/2 watt, carbon	23X20X271K
R-150	33,000 ohms 1/2 watt, carbon	23X20X333K
*R-151,152	10,000 ohms 1/2 watt, carbon	23X20X103J
R-153	10 megohms 1/2 watt, carbon	23X20X106M
R-155	270 ohms 1 watt, carbon	23X30X271K
R-156	15,000 ohms 10 watts, WW; flat	24A922
R-157	100,000 ohms 1/2 watt, carbon	23X20X104M
R-158	1000 ohms 5 watts, WW; flat	24A921
R-160,162	560 ohms 1/2 watt, carbon (part of L-108)	---
R-161	1000 ohms 1/2 watt, carbon (part of L-108)	---
R-164	750 ohms 10 watts, WW; flat	24A920
R-165	3900 ohms 1/2 watt, carbon	23X20X392K
*R-166	120,000 ohms 1 watt, carbon	23X30BF124K
R-167,177	330,000 ohms 1/2 watt, carbon	23X20X334K
R-168,191	820,000 ohms 1/2 watt, carbon	23X20X824K
R-169	82,000 ohms 1 watt, carbon	23X30X823K
*R-170	330,000 ohms 1 watt, carbon	23X30BF334J
R-172	68,000 ohms 1/2 watt, carbon	23X20X683K
R-173	150,000 ohms 1/2 watt, carbon	23X20X154K
R-176	50,000 ohms, HORIZONTAL DRIVE control	25A858
*R-178	47,000 ohms 1 watt, carbon	23X30BF473K

SERVICE PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
	RESISTORS (Cont.)	
R-179,192	470,000 ohms 1/2 watt, carbon	23X20X474M
*R-181	220 ohms 3 watts, WW	24A925
*R-182	200 ohms 5 watts, WW	24A926
R-183	2200 ohms 1 watt, carbon	23X30X222K
R-184	3.3 ohms 1/2 watt, carbon	23X20X033K
R-185	1 megohm 1 watt, carbon	23X30X105M
R-186	150,000 ohms 1/2 watt, carbon	23X20X154M
R-187	680 ohms 1/2 watt, carbon	23X20X681M
R-188	20 ohms 7.5 watts, WW	24A947
	TUBE COMPLEMENT	
V-1	6CB6; r-f amplifier (part of TV tuner)	----------
V-2	6J6; oscillator/mixer (part of TV tuner)	----------
V-101,102,103 105	6CB6; 1st, 2nd, and 3rd i-f amplifiers and video amplifier	90X6CB6
V-104,110	6AL5; video and f-m detectors	90X6AL5
V-106,107	12AU7; sync. amp. and sep. - sync. clipper and vert. oscillator or	90X12AU7
	6SN7-GT; same as above	90X6SN7-GT
V-108	6S4; vertical amplifier	90X6S4
V-109	6AU6; audio i-f amplifier	90X6AU6
V-111	6AV6; audio amplifier or	90X6AV6
	6SQ7; audio amplifier	90X6SQ7
V-112	6AQ5; audio output	90X6AQ5
V-113	6AX5-GT; low voltage rectifier	90X6AX5-GT
V-114	5U4G; low voltage rectifier	90X5U4G
V-115	6SN7-GT; horizontal oscillator	90X6SN7-GT
V-116	6AU5; horizontal amplifier	90X6AU5
V-117	6W4-GT; damper	90X6W4-GT
V-118	1B3-GT; high voltage rectifier	90X1B3-GT
V-119	17BP4A picture tube	90X17BP4A
	MISCELLANEOUS PARTS	
	Bracket, deflection yoke and focus coil mtg. (lower)	67D1235
	Bracket, deflection yoke and focus coil mtg. (upper)	67D1348
	Bracket, deflection yoke mtg. (mtd. on 67D1348)	67C1244
	Bracket, deflection yoke support	67B1305
	Bracket, mounting for TS-101 and SO-101	67C1258
	Bracket, picture tube mtg.; front right	67D1303
	Bracket, picture tube mtg.; front left	67D1302
	Collar, picture tube mtg.; rubber (mtd. in front of deflection yoke)	16C202
	Cushion, picture tube mounting	16C163
F-101	Fuse, 1/4 amp. 125 V., slow blow	39A344
	Ion trap	21A101
	Lever, centering control	74B337
	Plate, tuner access	8B1305
PL-104	Plug, picture tube anode	10A377
PL-105	Plug, 9 pin; color adapter	10A299
	Ring, centering (part of 67C1386)	76B636
	Shell for PL-105	69A369
SO-101	Socket, a-c power	10A286
	Socket assembly, high voltage rectifier tube	6A355
	Socket, miniature 7 pin tube; wafer	6B314 or 6A340

Schematic Symbol	Description	Hallicrafters Part Number
	MISCELLANEOUS PARTS (Cont.)	
	Socket, miniature 9 pin tube; wafer	6A388
	Socket, miniature 9 pin tube; molded mica filled	6A360
SO-105	Socket, 9 pin; color adapter	6A370
	Socket, octal; molded	6B296
	Socket, octal; molded mica filled	6A373
	Socket, picture tube	6A386
SO-103	Socket, speaker	10A373
	Strap, picture tube mtg.	76B596
S-103	Switch, s.p.s.t. (HIGH-LOW LINE)	60A249
S-101	Switch, OFF/ON (part of R-154)	-------
S-102	Switch, BW/COLOR	60B435, 60B428 or 60B390
TS-101	Terminal strip, antenna	88A020 or 88A679
	Tuning unit assembly; complete with tubes	1D961, 1D1055, 1A1077 or 1D1088
	CABINET PARTS	
	Antenna, Silver Vortex	57C147
	Cabinet (model 17824A)	78F663
	Cabinet (model 17906)	78F744
	Cabinet (model 17908)	78F627
	Cabinet (model 17922)	78F737
	Cabinet back (model 17824A)	8A1619
	Cabinet back (model 17906)	8-1614
	Cabinet back (model 17908)	8D1613
	Cabinet back (model 17922)	8D1612
	Clip, escutcheon mounting (models 17906, 17922)	76A850
	Escutcheon, front controls (model 17824A)	7D264
	Escutcheon, front controls (models 17906, 17908 & 17922)	7D312
	Escutcheon, picture tube (model 17824A)	7D196
	Escutcheon, picture tube (models 17906 & 17922)	7D315
	Glass, safety (models 17824A, 17906 & 17922)	22D292
	Glass, safety (model 17908)	22D323
	Knob, BW/COLOR switch	15D454
	Knob, CHANNEL SELECTOR control	15D293
	Knob, CONTRAST, FOCUS or VERTICAL HOLD controls	15B269
	Knob, FINE TUNING control	15A299
	Knob, OFF-VOLUME, BRIGHTNESS or HORIZONTAL HOLD controls	15B234
PL-101	Line cord and plugs	87A1668
	Mask, picture tube (model 17824A)	7D223
	Mask, picture tube (model 17906)	7D253
	Mask, picture tube (model 17908)	7D262
	Mask, picture tube (model 17922)	7D329
PL-102	Plug, safety interlock (part of PL-101	------
PL-103	Plug, speaker	10A372
	Screw, safety glass fastening (models 17906, 17922)	3PXCT
	Shield, picture tube (mounted on cabinet back)	69A349
LS-101	Speaker, 5 inch PM	85C103
LS-101	Speaker, 8 inch PM	85C104
	Washer, safety glass retaining; rubber (models 17906, 17922)	4A1144
	Washer, safety glass retaining; steel (models 17906, 17922)	4A493

* USE EXACT REPLACEMENT PART ONLY



NOTES (CONT.)

ASURED BETWEEN TUBE SOCKET TERMINALS
RO SIGNAL INPUT.

C AND POSITIVE UNLESS OTHERWISE SPECIFIED.

EASURED WITH A VTVM.

OLTAGES MEASURED AT THESE TERMINALS
LESS.

RMAL PICTURE OPERATION UNLESS OTHERWISE

IN HEAVY BLACK LINES.

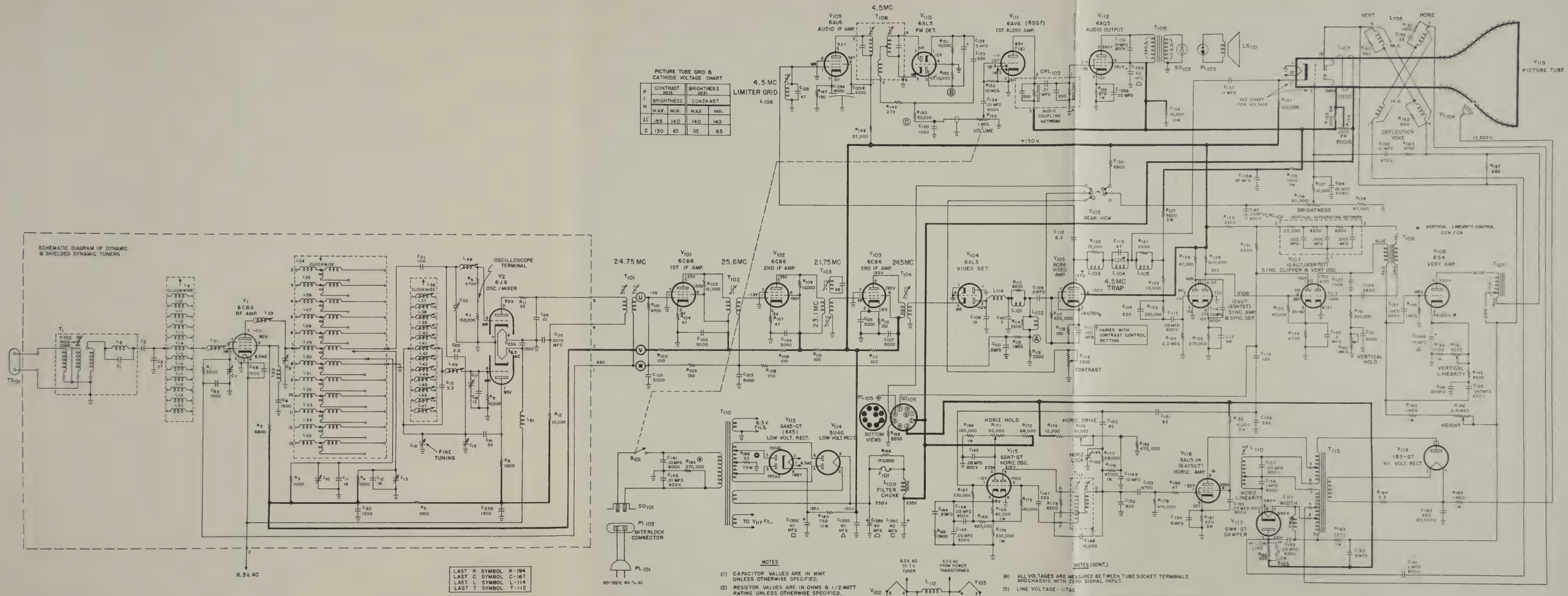
Fig. 27. Schematic Diagram

SERVICE PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
	RESISTORS (Cont.)	
R-179,192	470,000 ohms 1/2 watt, carbon	23X20X474M
*R-181	220 ohms 3 watts, WW	24A925
*R-182	200 ohms 5 watts, WW	24A926
R-183	2200 ohms 1 watt, carbon	23X30X222K
R-184	3.3 ohms 1/2 watt, carbon	23X20X033K
R-185	1 megohm 1 watt, carbon	23X30X105M
R-186	150,000 ohms 1/2 watt, carbon	23X20X154M
R-187	680 ohms 1/2 watt, carbon	23X20X681M
R-188	20 ohms 7.5 watts, WW	24A947
	TUBE COMPLEMENT	
V-1	6CB6; r-f amplifier (part of TV tuner)	----------
V-2	6J6; oscillator/mixer (part of TV tuner)	----------
V-101,102,103 105	6CB6; 1st, 2nd, and 3rd i-f amplifiers and video amplifier	90X6CB6
V-104,110	6AL5; video and f-m detectors	90X6AL5
V-106,107	12AU7; sync. amp. and sep. - sync. clipper and vert. oscillator or	90X12AU7
	6SN7-GT; same as above	90X6SN7-GT
V-108	6S4; vertical amplifier	90X6S4
V-109	6AU6; audio i-f amplifier	90X6AU6
V-111	6AV6; audio amplifier or	90X6AV6
	6SQ7; audio amplifier	90X6SQ7
V-112	6AQ5; audio output	90X6AQ5
V-113	6AX5-GT; low voltage rectifier	90X6AX5-GT
V-114	5U4G; low voltage rectifier	90X5U4G
V-115	6SN7-GT; horizontal oscillator	90X6SN7-GT
V-116	6AU5; horizontal amplifier	90X6AU5
V-117	6W4-GT; damper	90X6W4-GT
V-118	1B3-GT; high voltage rectifier	90X1B3-GT
V-119	17BP4A picture tube	90X17BP4A
	MISCELLANEOUS PARTS	
	Bracket, deflection yoke and focus coil mtg. (lower)	67D1235
	Bracket, deflection yoke and focus coil mtg. (upper)	67D1348
	Bracket, deflection yoke mtg. (mtd. on 67D1348)	67C1244
	Bracket, deflection yoke support	67B1305
	Bracket, mounting for TS-101 and SO-101	67C1258
	Bracket, picture tube mtg.; front right	67D1303
	Bracket, picture tube mtg.; front left	67D1302
	Collar, picture tube mtg.; rubber (mtd. in front of deflection yoke)	16C202
	Cushion, picture tube mounting	16C163
F-101	Fuse, 1/4 amp. 125 V., slow blow	39A344
	Ion trap	21A101
	Lever, centering control	74B337
	Plate, tuner access	8B1305
PL-104	Plug, picture tube anode	10A377
PL-105	Plug, 9 pin; color adapter	10A299
	Ring, centering (part of 67C1386)	76B636
	Shell for PL-105	69A369
SO-101	Socket, a-c power	10A286
	Socket assembly, high voltage rectifier tube	6A355
	Socket, miniature 7 pin tube; wafer	6B314 or 6A340

Schematic Symbol	Description	Hallicrafters Part Number
	MISCELLANEOUS PARTS (Cont.)	
	Socket, miniature 9 pin tube; wafer	6A388
	Socket, miniature 9 pin tube; molded mica filled	6A360
SO-105	Socket, 9 pin; color adapter	6A370
	Socket, octal; molded	6B296
	Socket, octal; molded mica filled	6A373
	Socket, picture tube	6A386
SO-103	Socket, speaker	10A373
	Strap, picture tube mtg.	76B596
S-103	Switch, s.p.s.t. (HIGH-LOW LINE)	60A249
S-101	Switch, OFF/ON (part of R-154)	-------
S-102	Switch, BW/COLOR	60B435, 60B428 or 60B390
TS-101	Terminal strip, antenna	88A020 or 88A679
	Tuning unit assembly; complete with tubes	1D961, 1D1055, 1A1077 or 1D1088
	CABINET PARTS	
	Antenna, Silver Vortex	57C147
	Cabinet (model 17824A)	78F663
	Cabinet (model 17906)	78F744
	Cabinet (model 17908)	78F627
	Cabinet (model 17922)	78F737
	Cabinet back (model 17824A)	8A1619
	Cabinet back (model 17906)	8-1614
	Cabinet back (model 17908)	8D1613
	Cabinet back (model 17922)	8D1612
	Clip, escutcheon mounting (models 17906, 17922)	76A850
	Escutcheon, front controls (model 17824A)	7D264
	Escutcheon, front controls (models 17906, 17908 & 17922)	7D312
	Escutcheon, picture tube (model 17824A)	7D196
	Escutcheon, picture tube (models 17906 & 17922)	7D315
	Glass, safety (models 17824A, 17906 & 17922)	22D292
	Glass, safety (model 17908)	22D323
	Knob, BW/COLOR switch	15D454
	Knob, CHANNEL SELECTOR control	15D293
	Knob, CONTRAST, FOCUS or VERTICAL HOLD controls	15B269
	Knob, FINE TUNING control	15A299
	Knob, OFF-VOLUME, BRIGHTNESS or HORIZONTAL HOLD controls	15B234
PL-101	Line cord and plugs	87A1668
	Mask, picture tube (model 17824A)	7D223
	Mask, picture tube (model 17906)	7D253
	Mask, picture tube (model 17908)	7D262
	Mask, picture tube (model 17922)	7D329
PL-102	Plug, safety interlock (part of PL-101	------
PL-103	Plug, speaker	10A372
	Screw, safety glass fastening (models 17906, 17922)	3PXCT
	Shield, picture tube (mounted on cabinet back)	69A349
LS-101	Speaker, 5 inch PM	85C103
LS-101	Speaker, 8 inch PM	85C104
	Washer, safety glass retaining; rubber (models 17906, 17922)	4A1144
	Washer, safety glass retaining; steel (models 17906, 17922)	4A493

* USE EXACT REPLACEMENT PART ONLY



NOTES

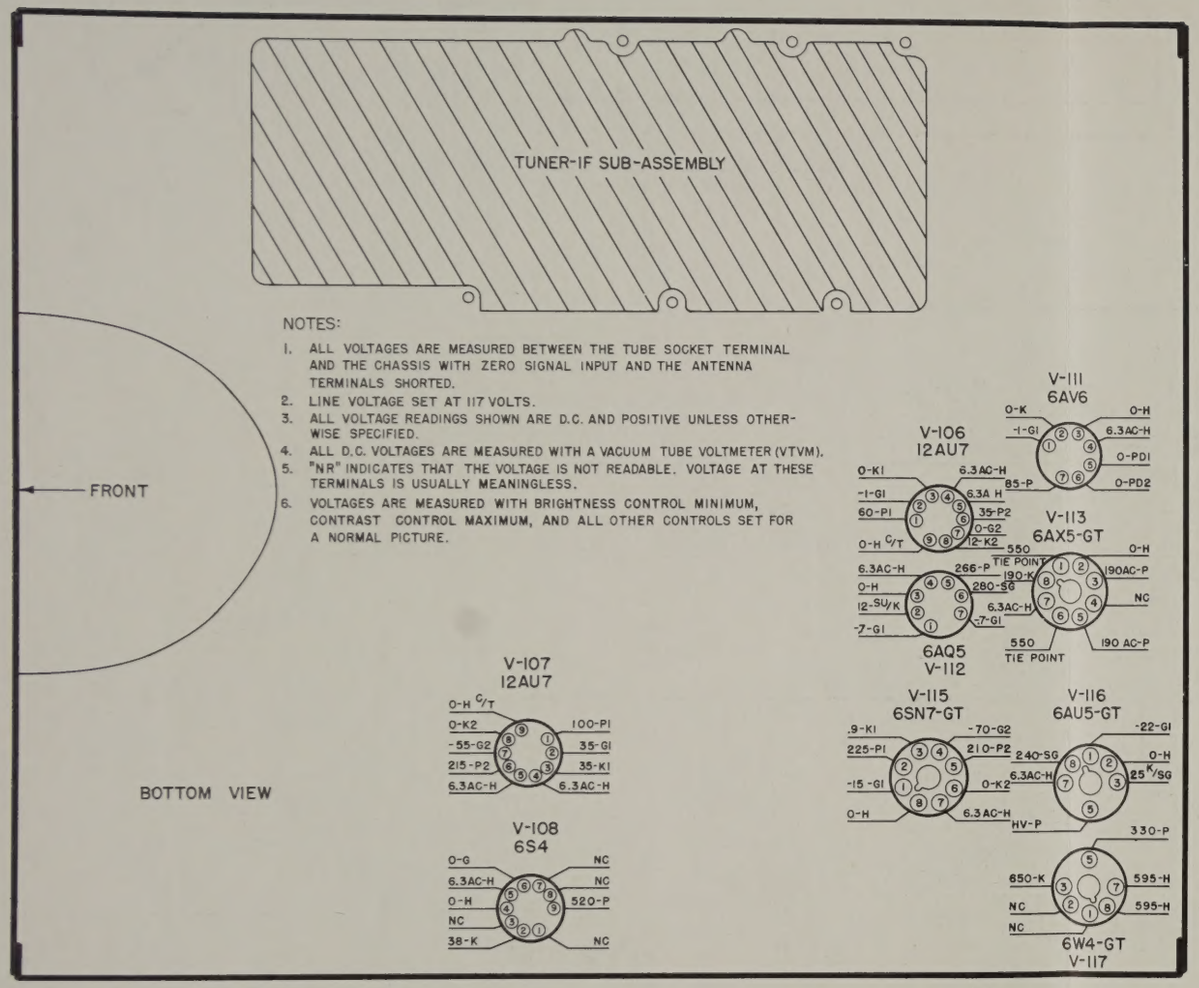
(1) CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.
(2) RESISTOR VALUES ARE IN OHMS @ 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.
(3) BW-COLOR SWITCH (S-102) IN BW POSITION.
* DO NOT MEASURE VOLTAGE AT THIS POINT
◉ THIS RESISTOR WILL NOT BE FOUND ON ALL CHASSIS.
● R-188 USED ONLY WITH ENGLISH MAKE (VARLEY) POWER TRANSFORMER.

NOTES (CONT.)

(4) ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.
(5) LINE VOLTAGE - 117AC
(6) ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE SPECIFIED
(7) DC VOLTAGES ARE MEASURED WITH A VTVM
(8) "NR"-NOT READABLE, VOLTAGES MEASURED AT THESE TERMINALS GENERALLY MEANINGLESS
(9) CONTROLS SET FOR NORMAL PICTURE OPERATION UNLESS OTHERWISE SPECIFIED.
(10) B+ LEADS ARE SHOWN IN HEAVY BLACK LINES.

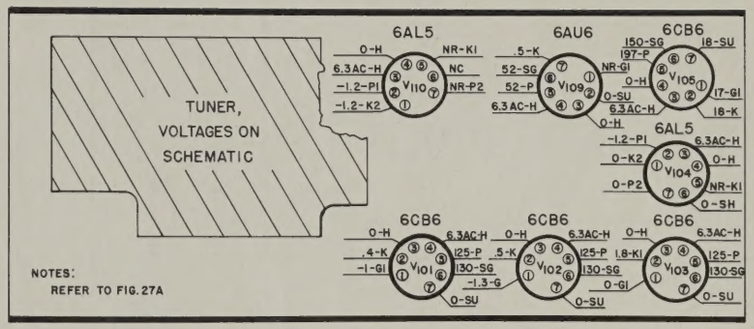
Fig. 27. Schematic Diagram

VALUES AND TOLERANCES SHOWN ARE NOMINAL AND VARIATIONS MAY BE FOUND. IT IS RECOMMENDED THAT THE VALUE OF ANY REPLACEMENT CORRESPOND TO THE NOMINAL VALUE OF THE PART BEING REPLACED.


TUNER-IF SUB-ASSEMBLY
NOTES:
1. ALL VOLTAGES ARE MEASURED BETWEEN THE TUBE SOCKET TERMINAL AND THE CHASSIS WITH ZERO SIGNAL INPUT AND THE ANTENNA TERMINALS SHORTED.
2. LINE VOLTAGE SET AT 117 VOLTS.
3. ALL VOLTAGE READINGS SHOWN ARE D.C. AND POSITIVE UNLESS OTHERWISE SPECIFIED.
4. ALL D.C. VOLTAGES ARE MEASURED WITH A VACUUM TUBE VOLTMETER (VTVM).
5. "NR" INDICATES THAT THE VOLTAGE IS NOT READABLE. VOLTAGE AT THESE TERMINALS IS USUALLY MEANINGLESS.
6. VOLTAGES ARE MEASURED WITH BRIGHTNESS CONTROL MINIMUM, CONTRAST CONTROL MAXIMUM, AND ALL OTHER CONTROLS SET FOR A NORMAL PICTURE.
FRONT
BOTTOM VIEW
V-107
12AU7
V-108
6S4
V-106
12AU7
V-111
6AV6
V-113
6AX5-GT
6AQ5
V-112
V-115
6SN7-GT
V-116
6AU5-GT
6W4-GT
V-117
TIE POINT

92C1669

Fig. 28. Voltage Chart for Main TV Chassis



92B1670

Fig. 29. Voltage Chart for I-F Sub-Assembly Chassis